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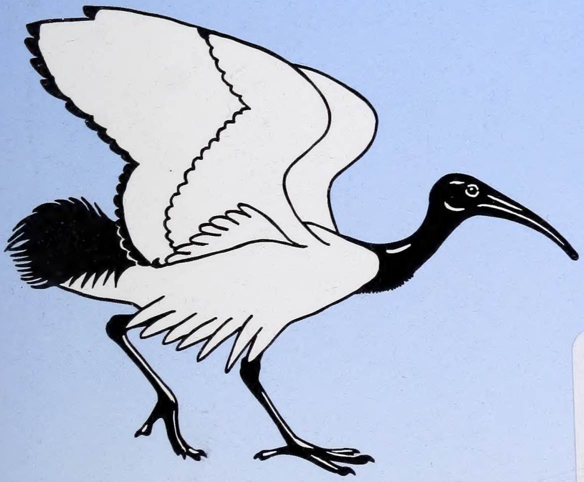
Bulletin of the British Ornithologists' Club



THE NATURAL
HISTORY MUSEUM
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Volume 130 No. 1
March 2010

MEETINGS are normally held in the ground floor of the Sherfield Building of **Imperial College**, South Kensington, London, SW7. This suite is now called the **Tower Rooms** and meetings will normally take place in **Section C** with the entrance opposite the Queen's Tower in the main quadrangle. The nearest Tube station is at South Kensington; a map of the area will be sent to members, on request. (Limited car parking facilities can be reserved [at a special reduced charge of **£5.00**], on prior application to the Hon. Secretary.)

The cash bar is open from **6.15 pm**, and a buffet supper, of two courses followed by coffee, is served at **7.00 pm.** (A vegetarian menu can be arranged if ordered at the time of booking.) Informal talks are given on completion, commencing at about 8.00 pm.

Dinner charges are **£22.50** per person.

FORTHCOMING MEETINGS

See also BOC website: **http://www.boc-online.org**

PLEASE NOTE THE MINOR CHANGE TO OUR REGULAR VENUE (see above). Section C of the renamed TOWER ROOMS is to the east of the previous venue of the Ante-room which no longer exists; this is nearer to the main entrance off Exhibition Road but still part of the Sherfield Building.

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16 March—Dr Julian Hume—*Birds of the Comoros Islands*
Dr Hume is a Research Associate of the Natural History Museum, Tring, and is currently working on fossil birds of the south-west Indian Ocean

Applications to Hon. Secretary (address below) by **2 March 2010**

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27 April—Annual General Meeting at 6.00 pm followed by a **Club Social Evening.**
There will be no booked speaker but members are invited to bring along one or two slides, a short PowerPoint presentation or a specimen (!) of a bird or ornithological subject of topical interest and to speak for not more than 5–10 minutes about it. The aim will be to generate discussion and to facilitate the exchange of information between members.

Applications to Hon. Secretary (address below) **by 13 April,** *including subjects to be raised and any special facilities (e.g. laptop computer) required.*

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22 June—Dr Lincoln Fishpool—*BirdLife International's Important Bird Area programme: a global perspective*
Dr Fishpool coordinates technical aspects of BirdLife's Important Bird Areas (IBA) programme. His talk will present a summary of the global programme through which sites critical for bird conservation worldwide are identified, documented and their protection sought. The talk will highlight recent developments, including the standardised methods by which sites are monitored, the uses to which resulting data are put, progress in identifying marine IBAs and how IBA methodology is contributing to the expansion of the approach to non-avian taxa: Key Biodiversity Areas.

Applications to Hon. Secretary (address below) by **8 June 2010**

Overseas Members visiting Britain are especially welcome at these meetings, and the Hon. Secretary would be very pleased to hear from anyone who can offer to talk to the Club giving as much advance notice as possible—please contact: S. A. H. (Tony) Statham, Ashlyns Lodge, Chesham Road, Berkhamsted, Herts. HP4 2ST, UK. Tel. +44 (0) 1442 876 995 (or e-mail: boc.sec@bou.org.uk).

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Bulletin of the
BRITISH ORNITHOLOGISTS' CLUB

Vol. 130 No. 1 Published 14 March 2010

CLUB ANNOUNCEMENTS

Committee was saddened to learn of the death of the following members: P. Tate—member since 1956 (Hon. Life Member since 2006, *Hon. Treasurer* 1962–74) and Cdr. F. S. Ward, RN—member since 1996

Members are reminded that subscriptions were due for renewal on 1 January 2010 and are again respectfully requested to check that any Standing Orders are correctly lodged with their banks. Subscriptions are £20 p.a. regardless of whether the subscriber is a member of the BOU or not.

ANNUAL GENERAL MEETING

The Annual General Meeting of the British Ornithologists' Club will be held in the Tower Rooms, Section A, Sherfield Building, Imperial College, London SW7 at 6.00 pm on Tuesday 27 April 2009.

AGENDA

1. Minutes of the 2009 Annual General Meeting (see Bull. Brit. Orn. Cl. 129: 66–67).
2. Chairman's report.
3. Trustees Annual Report and Accounts for 2009 (both to be distributed at the meeting).
4. The Bulletin. Editor's report—Mr G. M. Kirwan.
5. Publications report—Revd. T. W. Gladwin, Chairman JPC.
6. Election of Officers. The Committee proposes that:
   i) Mr S. A. H. Statham be re-elected as *Hon. Secretary*
   ii) Mr D. J. Montier be re-elected as *Hon. Treasurer*
   No changes to the committee are proposed, as all other members are eligible to serve at least one more year in office.
   Ex-officio members (in continuation): Revd. T. W. Gladwin (*Chairman Joint Publications Committee*), Mr S. P. Dudley (*Administration Manager*), and Mr G. M. Kirwan (*Hon. Editor*)
7. Any other business, of which advance notice has been given.

The 957th meeting of the Club was held on Tuesday 6 October 2009 in the Rector's Residence, Imperial College, 170 Queens Gate, London. Fifteen members and six guests were present.

Members attending were: Miss H. BAKER (*Chairman*), D. R. CALDER, F. M. GAUNTLETT, A. GIBBS, D. GRIFFIN, K. HERON JONES, R. H. KETTLE, R. R. LANGLEY, D. J. MONTIER, R. C. PRICE, Dr R. P. PRŶS-JONES, P. J. SELLAR, S. A. H. STATHAM, C. W. R. STOREY and P. J. WILKINSON

Guests attending were: Mrs J. CALDER, Dr D. DAWSON, Mrs M. H. GAUNTLETT, Prof. D. GOODE (*Speaker*), Mrs J. HERON JONES and Mrs M. MONTIER.

After dinner, Professor David Goode gave an illuminating talk on *Habitat change and its impact on species including avifauna, with predictions for London's natural history in 2058*. Progress in nature conservation over the last 30 years was reviewed, along with some of the more notable changes in London's natural history, to provide a basis for predictions for the next 50 years. Major factors responsible for changes in bird populations were summarised. Whilst London has a robust planning framework for nature conservation, which should ensure the protection of important habitats, climate change is expected to have significant impacts. Some current changes in the distribution of species resulting from climate change were discussed, using birds and dragonflies as examples.

Looking ahead, the danger of making firm predictions was recognised, but introduced species and climate change are likely to be the most significant factors. Current predictions for London's climate were summarised, which suggest that a northward movement of species from continental Europe colonising the UK will be enhanced by the heat island effect of the capital. Using predictions in the *Climatic atlas of European breeding birds* (Huntley *et al.* 2008), together with knowledge of London's habitats, an assessment was made of those species likely to be lost, and conversely those species currently rare or absent which are predicted to be breeding by late in the 21st century. It seems that 30 bird species could become established as new breeders. The results have been published in full in *The London Naturalist* 88 (2009).

REVIEW

Buckley, P. A., Massiah, E. B., Hutt, M. B., Buckley, F. B. & Hutt, H. F. 2009. *The birds of Barbados: an annotated checklist*. BOU Checklist No. 24. British Ornithologists' Union & British Ornithologists' Club, Peterborough. 295 pages, several maps and 78 colour plates. UK£40.00.

The latest of the BOU's Checklists, which covers the most oceanic of the Lesser Antilles, builds on the tradition of island avifaunas, especially West Indian ones, that has come to characterise the series. With honourable exceptions (Borneo being one), islands are often relatively species-poor (Barbados boasts just 263, of which two were added during the proof stage) which might suggest that such works would be easier to compile, but the germs of the present work date from the 1970s, if not earlier!

In comparison to most previous Checklists with insular subjects, Barbados is notably (but given its geographic location unsurprisingly) depauperate in endemics. Just one taxon, Barbados Bullfinch *Loxigilla barbadensis*, is currently recognised at species level and that but recently (following work by two authors of the present work in these pages; *Bull. Brit. Orn. Cl.* 124: 108–123). Just 30 species are listed as breeders (18 of them landbirds). However, Barbados has other attractions for the birdwatcher; as the authors state, '[it] is the Fair Isle of the Caribbean', and thus a veritable paradise for the modern-day migrant and vagrant hunter. Not only is the island on the main southbound migration route for many North American-breeding shorebirds, but rarities from just about every compass point have appeared on Barbados over the years. Despite the relative lack of observer coverage, as one of the many useful appendices notes the island can boast 39 'first' records for the West Indies, 14 'firsts' for the AOU Check-list area and a staggering 11 'firsts' for the Western Hemisphere. Of these totals, significant percentages are also 'unique' records (i.e. the species concerned have occurred nowhere else in the different regions). Old World vagrants are a speciality and some have even started to nest (or appear likely to do so in the future) on the island, a phenomenon not confined to Barbados as it seems that Squacco Heron *Ardeola ralloides* will soon be confirmed to breed on the Brazilian island of Fernando de Noronha (Silva e Silva & Olmos, 2006, *Rev. Bras. Orn.* 14: 470–474). Perhaps surprisingly, this species has yet to be found on Barbados, but it is listed as a potential addition to the avifauna in another appendix.

Following a typical suite of introductory sections, of which those on 'research agenda' (mainly taxonomic), 'enigmatic historical taxa' and 'unsupported species' perhaps draw the eye most, we are into the species accounts. These commence with world range, thence West Indies status and distribution, followed by a summation of the situation on Barbados, and close with a series of 'optional' sections on breeding, comments, and specimens, of which 'comments' is that most frequently employed. And, indeed these are frequently a mine of thought-provoking remarks, with especial foci on taxonomy and vagrancy. That for Caribbean Coot *Fulica caribaea* is just one of many good examples. The species accounts raise plenty of questions for those interested in surroundings regions too: where do all those Ruff *Philomachus pugnax* that pass through Barbados end up? Records in South America are almost nil. I'd have liked to have seen more references used to illuminate the section covering general West Indian status. Although the authors provide background to how this information was compiled (p. 60), quite a lot of 'grey literature' has been researched, which it would have been helpful to specify for at least some particular facts. Other complaints are 'picky': I noticed few 'typos', though I would expect the writers and editors of a Checklist to know that the English name of *Pterodroma arminjoniana* is spelt Trindade (just like the island on which it breeds). The photographic section arguably overdoes the number of habitat and landscape shots, whilst some of the vagrant photos are sufficiently 'documentary' that they add rather little in such a work as this.

Collectors of the series will not be disappointed and students of West Indian ornithology, in particular, should consider this work a 'must'. Those fascinated by vagrants and perhaps seeking a 'new' destination to pioneer will also be well advised to take a look at this book. The price might seem high, but is by and large compatible with the cost of avifaunas of a similar nature produced by commercial publishers.

Guy M. Kirwan

A new subspecies of Amazilia Hummingbird *Amazilia amazilia* from southern Ecuador

by Niels Krabbe & Robert S. Ridgely

Received 15 January 2008; final revision accepted 14 September 2009

SUMMARY.—A new subspecies of Amazilia Hummingbird *Amazilia amazilia* is described from the Ecuadorian Andes. It appears to be closest related to *A. a. alticola* from southern Loja and adjacent parts of Zamora-Chinchipe provinces in southern Ecuador.

The Amazilia Hummingbird *Amazilia amazilia* inhabits arid and semi-arid parts of western Peru and Ecuador. The five described subspecies differ mensurally and in the coloration of the bill, underparts, rump and tail. Weller (2000) described in detail the distinctive features and variation of these taxa, and suggested that the form *alticola* is better ranked as a full (biological) species. Based upon a preview of Weller's study, Schuchmann (1999) followed this, whereas Ridgely & Greenfield (2001) adhered to the more traditional classification, which is the course followed here and by Remsen *et al.* (2009).

During field work in southern Ecuador in the 1990s, expeditions by the Academy of Natural Sciences of Philadelphia collected specimens (Ridgely & Greenfield 2001) that suggested the existence of geographical variation within the range ascribed to *alticola* by Weller (2000). Birds from the northern end of the range differ consistently from birds in the south. This variation was mentioned briefly in Ridgely & Greenfield (2001), but no formal description was published.

Gould (1860) described the form *alticola* from a single specimen presented to him by Jules Bourcier. The specimen was purportedly taken in the 'Puna district of Peru', but because *alticola* has never been documented in Peru, the specimen is unquestionably mislabeled. The type description includes two characters suggestive that the type represents birds from the southern end of the range ascribed to *alticola* by Weller (2000). These are: 'bill black at the tip, the remainder white or flesh colour', and 'four outer ones [rectrices], on each side, washed on their outer edges with bronzy green'. Both characters, however, do vary somewhat in both populations. On the most distinctive difference between the two populations, the colour of the upper belly, Gould described the type of *alticola* as having 'flanks rich bright buff'. Northern birds have the buff confined to a small area on the flanks, whereas in southern birds the buff is much more extensive, meeting or nearly meeting on the upper belly in most specimens, but occasionally with a somewhat wider white area on the middle of the belly. Gould's wording is thus not entirely clear, but an examination by Mark Adams of the type revealed that its uppertail-coverts are washed greenish bronze, and its flanks and sides are decidedly more extensively rich buff (rufous) than in birds from the northern end of the range ascribed to *alticola*. We thus consider it beyond doubt that the name *alticola* applies to the southern population. Birds from the río Jubones drainage in northern Loja and southern Azuay provinces differ consistently to warrant subspecific recognition as a distinct taxon. We name this new form:

Amazilia amazilia azuay subsp. nov.

Holotype.—Museo Ecuatoriano de Ciencias Naturales, Quito (MECN) uncatalogued, collector's no. NK1–4.3.02; adult male collected by N. Krabbe on a semi-humid bushy slope in the Yunguilla Valley, Azuay Province, Ecuador, at 03°14'S, 79°17'W, elevation 1,650 m, on 4 March 2002. Tissue sample deposited at Zoological Museum, University of Copenhagen (ZMUC 128002). Label data.—Body mass 7.4 g. Irides blackish, upper mandible reddish pink on basal 5 mm on top and basal 3 mm on sides, rest blackish; lower mandible reddish pink with blackish tip (5 mm); feet blackish; testes 2.0 × 1.5 mm (inactive). Mensural data for the holotype and paratypes appear in Table 1.

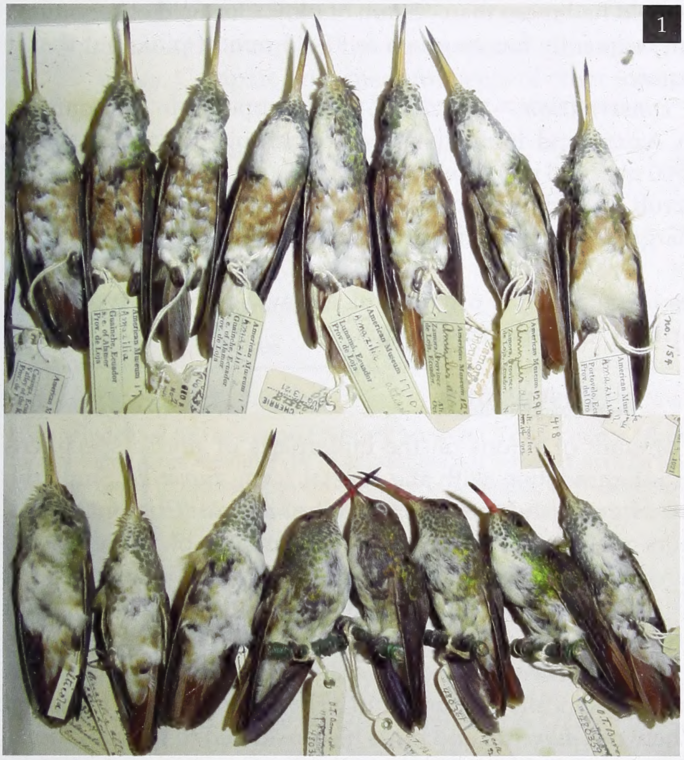
Paratypes.—Four additional specimens (all in MECN, uncatalogued) were taken along with the holotype in the Yunguilla Valley on 4 and 6 March 2002: collector's no. NK3–4.3.02 (male), NK2–6.3.02 (male), NK1–6.3.02 (immature male) and NK4–4.3.02 (female). Tissue from the paratypes is deposited at ZMUC (128004, 128007, 128006 and 128005, respectively).

Diagnosis.—Differs from *Amazilia a. alticola* by having a nearly pure white belly, the rufous on the sides being restricted to a small area on the lower flanks, by having more extensively and paler rufous in the tail and uppertail-coverts, and, apparently, by having the pink at the base of the upper mandible on average more limited in extent.

Description of holotype.—Colour names and numbers follow Smithe (1975). Crown Leaf Green (146), cheeks, back and wing-coverts between Shamrock Green (162B) and Peacock Green (162C), with a slight bronzy sheen, which is more pronounced on lower back and some feathers of rump, rest of rump, uppertail-coverts and most of tail Kingfisher Rufous (240); central pair of rectrices washed bronze-green on terminal half, next pair with similar wash on edges of terminal half, outer three pairs wholly rufous; greater primary-coverts dusky with slight greenish tinge, remiges dusky; underparts white, chin and throat with sparse golden green discs; neck- and breast-sides, and lesser underwing-coverts of secondaries golden-green, this colour extending as a few discs towards the centre of the lower breast, upper belly with very faint buffy wash; median underwing-coverts of secondaries, flanks and lateral undertail-coverts between Salmon Color (6) and Orange-Rufous (132C); greater underwing-coverts of secondaries, all underwing-coverts of primaries, and underside of remiges dusky.

Variation in the series.—The five specimens (three adult males, one immature male, one adult female) taken at the type locality (Fig. 2) on 4 and 6 March 2002 vary principally in the amount of bronzy green in the rectrices. The fifth (outer) and fourth rectrices are entirely rufous in four specimens, whereas they have a faint and narrow bronzy green fringe and spot near the tip of the outer web in the fifth specimen. The third rectrix is all rufous in two specimens, but in the other three has a 0.5–1.0 mm-wide edge of bronzy green on the terminal 12–14 mm of the outer web. The second and first (central) rectrices vary more greatly and are not alike in any two specimens. On the second the green ranges from covering only a 3-mm tip and tapering anteriorly along the edges of both webs to 14 mm from tip, to covering the entire outer web and the terminal 10 mm of the inner web. The first rectrix is yet darker, with rufous showing only on the basal portion of the feather, in the darkest specimen only as a dark rufous wash along the shaft, in the palest, as rufous covering half of each web to 13 mm from tip.

The rump and uppertail-coverts also vary. Most specimens have entirely rufous uppertail-coverts, but in one there is a wash of greenish bronze on the longest. The rump feathers are generally greenish bronze with narrow rufous fringes, but some of the lateral ones are entirely rufous in some specimens. Four specimens have *c*.5 mm of pink at the base of the upper mandible, whereas the immature male (by the size of its testes), has only a faint reddish wash to the base of the culmen and has the basal 2 mm of the sides of the upper mandible buff. The immature does not differ from the adults in plumage.



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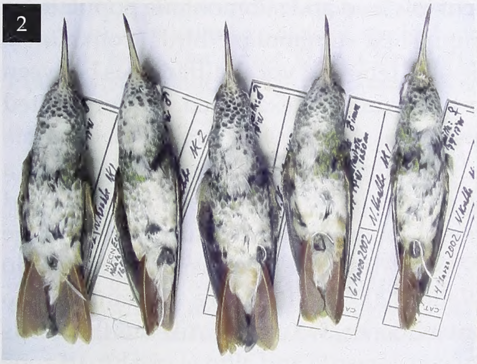

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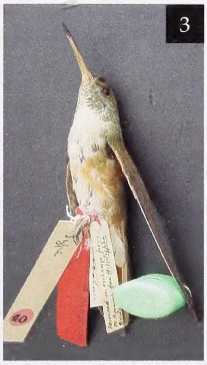

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Figure 1. Eight specimens of *Amazilia amazilia alticola* (including some *alticola / dumerilii* intergrades) (top) and eight specimens of *Amazilia amazilia azuay* (bottom), held at the American Museum of Natural History, New York (Niels Krabbe)

Figure 2. The topotypical series of *Amazilia amazilia azuay*, the holotype furthest left, held at the Museo Ecuatoriano de Ciencias Naturales, Quito (Niels Krabbe)

Figure 3. Type specimen of *Amazilia amazilia alticola*, held at The Natural History Museum, Tring (BMNH 1888.7.25.139) (Mark P. Adams / © The Natural History Museum, Tring)

***Comparison of A. a. azuay with A. a. alticola*.**—Specimens of *A. a. azuay* differ consistently from *A. a. alticola* in their pale bellies. Variation is considerable in the amount of rufous on the belly in *alticola*; in some specimens the rufous of the sides only meets or nearly meets on the upper belly, whereas in others it extends to cover the entire belly. Even in the palest specimens, the rufous is decidedly brighter and more extensive than in *azuay* (Fig. 1). Like *azuay*, *alticola* varies in the amount of greenish bronze in the tail, and the extremes of the two come close in this respect. As a general rule, however, the greenish bronze in the tail of *alticola* is more extensive than in *azuay*, and the rufous in the tail somewhat darker. The uppertail-coverts of *alticola* are greenish bronze, the lateral ones occasionally rufous, but then darker rufous than in *azuay*, which has entirely rufous uppertail-coverts in most specimens. The amount of pink at the base of the upper mandible appears to average more extensive in *alticola*, but variation in this character is pronounced. None of the type series of *azuay* or of birds observed in the field had more than *c.*5 mm of pink. Our field observations of *alticola* indicate that this form frequently has as much as 13–15 mm of pink, but that it occasionally shows as little as *azuay*.

Distribution, habitat and conservation.—*Amazilia a. azuay* appears to be confined to the río Jubones drainage in Azuay and immediately adjacent Loja provinces, south-central Ecuador, at 1,000 to *c.*2,500 m (2,920 m?) (Weller 2000; pers. obs.). Like *alticola*, *azuay* inhabits arid to semi-humid scrub, including heavily disturbed areas and gardens. It is fairly common and tolerates a large degree of disturbance, giving no cause for concern for its survival.

Etymology.—We name this taxon after the province of Azuay, where the type series was taken, and where the majority of the population occurs.

Discussion

The great variation in the amount of rufous on the underparts of *alticola* specimens (Figs. 1 and 3) suggests broad intergradation with the coastal form *dumerilii*. Similarly, variation is great in the amount of greenish bronze in the tail of *alticola* (Chapman 1926, Weller 2000). Both these authors reported an increase in the amount of white on the underparts in *dumerilii* specimens from the coast to specimens from the submontane parts of south-west Ecuador. Chapman considered the submontane population along with *alticola* to represent intergradation between *dumerilii* and *leucophoea* of north-west Peru. Weller, on the other hand, considered the submontane birds a geographic variant of *dumerilii*, and believed that these birds were specifically distinct from *alticola*. He reported mensural differences (mainly tail length) between *dumerilii* and birds he considered to be true *alticola*. He did not, however, give separate measurements of lowland and submontane populations of *dumerilii*, and it is not quite clear how he distinguished submontane birds from *alticola* other than by the length of the central rectrices. He also reported vocal differences between the two, but gave no sample size of the number of recordings examined. In our limited vocal material of *azuay*, *alticola* and coastal populations of *dumerilii* (nine, one and six recordings, respectively), almost every individual is different. We have similarly noted a large repertoire in vocalisations of another species of *Amazilia* (Rufous-tailed Hummingbird *A. tzacatl*). Other species of hummingbirds have been reported to have surprisingly large repertoires as well as local dialects (e.g. Gaunt 1996, González & Ornelas 2005), so we do not consider the vocal differences reported by Weller (2000) sufficiently substantiated to support treating *alticola* as a full species. On present evidence, we cannot rule out that birds from the submontane region are intermediates between *dumerilii* and *alticola* in a broad zone of intergradation and that *azuay* forms the end of such a cline. Great variation in *alticola* and *dumerilii* specimens from a broad zone of intergradation, rather than a dominance of parental types (see Johnson *et al.* 1999, Helbig *et al.* 2002, Patten & Unitt 2002), would support *alticola* being worthy of no more than subspecific rank. In this respect, there would be a stronger case for ranking *azuay* as a full species, as it appears to be geographically isolated under present climatic conditions. Its range is separated from that of *alticola* by the Cordilleras de Chilla, Tioloma and Cordoncillo, between the Jubones, Catamayo and Zamora drainages. The crests of these mountains exhibit more humid conditions than preferred by *azuay*, and no pass lies below the known upper altitudinal limit of this form. Owing to the humid conditions in El Oro and the Pacific slope where the río Jubones cuts through the Andes, it also seems unlikely that *azuay* comes into contact with coastal *dumerilii*. Because *azuay* and *alticola* differ less from each other than do some other subspecies of *A. amazilia*, however, we suggest that *azuay* is best afforded subspecific rank.

TABLE 1

Measurements (in mm) of the type series of Amazilia Hummingbird *Amazilia amazilia azuay*. Compare with measurements of other forms given by Weller (2000).

Collector's no.	Sex	Bill	Wing	Rectrix 1 (central)	Rectrix 5 (outer)
NK1–4.3.02	male (type)	21.5	64.2	32.8	35.2
NK3–4.3.02	Male	20.1	63.2	31.8	35.2
NK2–6.3.02	Male	21.1	60.2	31.7	34.5
NK1–6.3.02	Immature male	22.6	57.1	29.8	32.2
NK4–4.3.02	female	c.22	58.0	33.3	34.2

Acknowledgements

We are indebted to The Natural History Museum, Tring, curator Mark P. Adams for loan of specimens and for photographs of the holotype of *alticola*; to Paul Sweet, American Museum of Natural History, New York, for permission to examine specimens; and to J. Fjeldså, F. G. Stiles and an anonymous reviewer for useful comments on the manuscript, as well as to G. M. Kirwan for additional editorial comments.

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Addresses: Niels Krabbe, Zoological Museum, University of Copenhagen, Universitetsparken 15, DK-2100, Copenhagen Ø, Denmark, e-mail: nkkrabbe@snm.ku.dk. Robert S. Ridgely, P.O. Box 58, North Sandwich, NH 03259, USA, e-mail: rridgely@earthlink.net.

APPENDIX

Specimens examined:

A. a. azuay: Yunguilla Valley: 5 males, 1 female (including the holotype); Guishapa, Oña: 1 female; Giron: 1 female. Ten old specimens labelled 'Loja' and 'Ecuador' also appear to belong here.

A. a. alticola or *A. a. alticola / dumerilii* intergrades: Casanga: 1 male, 1 female; Río Zamora: 1 unsexed; Zamora: 2 males; Río Pindo: 1 unsexed; 'Loja' 1 male, 2 unsexed; Guainche: 1 male, 3 unsexed; Lunamá: 2 males, 1 female; Portovelo: 2 males, 3 unsexed.

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Ecological and distributional notes on hummingbirds from Bolivian lowland forests

by Stefan Abrahamczyk & Michael Kessler

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Summary.—Little is known about the distribution, ecology and behaviour of hummingbirds in the Andean foothills of Bolivia, where many lowland hummingbird species reach their south-western distributional limits. In November 2007–October 2008, we surveyed hummingbirds at six sites along a 660-km transect, from tropical Amazonian humid forest to subtropical spiny forest of the Gran Chaco. In total, we found 21 hummingbird species. For ten of these, we provide new information on latitudinal and elevational movements, feeding or breeding behaviour. In particular, we provide evidence for seasonal movements of five species, including such widespread taxa as White-chinned Sapphire *Hylocharis cyanus* and Fork-tailed Woodnymph *Thalurania furcata*, which are considered sedentary throughout most of their ranges, but which appear to undergo seasonal movements at their range limits in Bolivia.

Little is known concerning the distribution, ecology, and behaviour of hummingbirds in the Andean foothills of Bolivia, where many lowland hummingbird species reach their south-west distributional limits (Schuchmann 1999). Between November 2007 and October 2008, SA surveyed hummingbirds at six sites along a 660-km transect from tropical Amazonian humid forest to subtropical spiny forest of the Gran Chaco during the rainy and dry seasons. From north to south, our study was conducted at Villa Tunari, dpto. Cochabamba (16°57′S, 65°24′W; 400 m), Sacta, dpto. Cochabamba (17°06′S, 64°47′W; 204 m), Buena Vista, dpto. Santa Cruz (17°30′S, 63°38′W; 424 m), Santa Cruz, dpto. Santa Cruz (17°46′S, 63°04′W; 397 m), Río Seco, dpto. Santa Cruz (18°42′S, 63°11′W; 434 m), and Corbalán, dpto. Tarija (21°36′S, 62°27′W; 268 m). Along this transect, mean annual precipitation decreases, from 6,258 mm at Villa Tunari to 410 mm at Corbalán, whilst seasonality in temperature and precipitation increases (Kessler *et al.* 2007). The survey sites consisted of primary and occasionally slightly disturbed forest. Each locality was visited twice for 16 days, once during the dry season (May–October) and once during the rainy season (November–April). Hummingbird species, their activity and the plant species visited were noted. Additionally, hummingbird observations were made en route to and from the study sites. Because hummingbirds are difficult to count, species abundance was grouped by three categories: 1–3 per visit (uncommon), 4–9 per visit (common), and >10 per visit (very common). Species identifications were made by SA using Erize *et al.* (2006).

In total, we found 21 hummingbird species (Table 1). For ten of these, we provide new information on latitudinal and elevational movements, feeding or breeding behaviour. In particular, we provide evidence for seasonal movements by five species, including the widespread White-chinned Sapphire *Hylocharis cyanus* and Fork-tailed Woodnymph *Thalurania furcata*, which are considered sedentary throughout most of their ranges (Schuchmann 1999), but which appear to undergo seasonal movements at their range limits in Bolivia.

TABLE 1
Hummingbird diversity and abundance of the study sites during the rainy season (R) and dry season (D); 1 = uncommon, 2 = common, 3 = very common.

	Corbalán (R)	Corbalán (D)	Río Seco (R)	Río Seco (D)	Santa Cruz (R)	Santa Cruz (D)	Buena Vista (R)	Buena Vista (D)	Sacta (R)	Sacta (D)	Villa Tunari (R)	Villa Tunari (D)
White-bellied Hummingbird *Amazilia chinogaster*				1						1		
Glittering-throated Emerald *Amazilia fimbriata*									1			
Black-throated Mango *Anthracothorax nigricollis*								2				
Grey-breasted Sabrewing *Campylopterus largipennis*			1				3		3			2
White-bellied Woodstar *Chaetocerus mulsantii*							1					
Glittering-bellied Emerald *Chlorostilbon aureoventris*	1	3		3	1							
Collared Inca *Coeligena torquata*									1			
White-necked Jacobin *Florisuga mellivora*							1		1			
Rufous-breasted Hermit *Glaucis hirsutus*									1		1	
Violet-fronted Brilliant *Heliodoxa leadbeateri*							1					
Blue-tufted Starthroat *Heliomaster furcifer*	1	1										
Gilded Sapphire *Hylocharis chrysura*			3	3	3	2						
White-chinned Sapphire *Hylocharis cyanus*			1				2	2		2		
Rufus-crested Coquette *Lophornis delattrei*										1		
White-bearded Hermit *Phaethornis hispidus*							1					
Great-billed Hermit *Phaethornis malaris*									3	2	2	2
Reddish Hermit *Phaethornis ruber*									2	2	2	2
White-browed Hermit *Phaethornis stuarti*							2	2				
Buff-bellied Hermit *Phaethornis subochraceus*					2	2	3	3				
Fork-tailed Woodnymph *Thalurania furcata*	3	1					3	3	1	3	2	3
Pale-tailed Barthroat *Threnetes leucurus*											1	

GREY-BREASTED SABREWING *Campylopterus largipennis*

C. largipennis was very common at Sacta and Buena Vista during the rainy season in November and December 2007, when *Heliconia episcopalis* (Heliconiaceae), *Palicourea lasiantha* (Rubiaceae) and *Erythrochiton fallax* (Rutaceae) were flowering en masse, but during the dry season in August / September it was not observed at either site. At Villa Tunari, it was not recorded in May 2008 but was fairly common in July 2008 when *Passiflora coccinea* (Passifloraceae) was flowering. Similar seasonal shifts in the abundance of *C. largipennis* have been observed in Amacayacu National Park, Colombia, where the species is present only during the main flowering period of the common understorey shrub *Palicourea crocea* (Rubiaceae) (Cotton 2007). Apparently, this comparatively large hummingbird conducts regional movements and only occurs at a given locality when large numbers of suitable flowers are available in the understorey.

On 18 February 2008, SA observed a single *C. largipennis* at Río Seco, *c.*100 km south of the usual south-west range limit (http://www.natureserve.org/infonatura/). This suggests that movements might not only be local.

A nest of *C. largipennis* was observed at Sacta on 21–24 November 2007. It was located in a small tree, *c.*1.5 m above the ground, in primary tropical rainforest next to a small path. It was cup-shaped, constructed of plant fibres, covered with mosses and lichens, and contained two white eggs. In Brazil, *C. largipennis* breeds in June (Schuchmann 1999). Next to the nest SA observed *Campylopterus* drinking water dripping from a hole in a tree in flight.

GLITTERING-BELLIED EMERALD *Chlorostilbon aureoventris*

This species showed strong seasonal variation in relative abundance at several localities. At Corbalán, it was very rare in January 2008 but very common in late May 2008 when it mostly fed on *Tripodanthus acutifolius*, a hemiparasitic Loranthaceae that was flowering in large numbers. At Río Seco, *C. aureoventris* was not observed during the rainy season (February 2008), but was common during the dry season in June 2008, when *Anisacanthus boliviensis* (Acanthaceae) was flowering. In the city of Santa Cruz, *C. aureoventris* visited some parks during the end of the wet season in April when *Chorisia insignis* (Malvaceae) was blooming in large numbers. Thereafter it was not observed again.

Breeding of *C. aureoventris* was observed in Corbalán during the early dry season at the end of May 2008. SA found a nest constructed of plant fibres attached to a piece of metal under the roof of the research station, *c.*2 m above ground. The year before, a similar site in an adjacent building was used for nesting (pers. comm. of the local ranger). In Brazil, *C. aureoventris* breeds in September–November (Oniki & Antunes 1998).

COLLARED INCA *Coeligena torquata*

SA observed a male feeding on flowers of *Calathea* sp. (Maranthaceae) at Sacta on 17 November 2007. *C. torquata* is a typical Andean species, which normally occurs from 1,500 m and higher (Schuchmann 1999, Hennessey *et al.* 2003). During the following night, a front of low air pressure arrived from the south, which reduced temperatures by *c.*10°C. Possibly, the downslope movement of this *C. torquata* was related to the cold front, as hummingbirds are well known to move elevationally in response to adverse weather (Hobson *et al.* 2003).

VIOLET-FRONTED BRILLIANT *Heliodoxa leadbeateri*

A female was observed on 20 December 2007 feeding on *Erythrochiton fallax* (Rutaceae) at Buena Vista (424 m). Normally, this species occurs above 800 m in Bolivia (Hennessey *et al.* 2003).

GILDED SAPPHIRE *Hylocharis chrysura*

Very common during the late wet and early dry seasons (April–July 2008) in the city and Botanical Garden of Santa Cruz. At the end of the dry season (September–October 2008) it was not observed in the city and was much less common in the Botanical Garden, even though suitable flowers were abundant in city gardens. This is indicative of some regional movements, which also are known from Brazil (Schuchmann 1999). In city gardens, *H. chrysura* often fed on *Malvaviscus arboreus* (Malvaceae) by laterally piercing the flowers.

WHITE-CHINNED SAPPHIRE *Hylocharis cyanus*

During the dry season in September 2008, this species was observed several times at Sacta, feeding on *Lantana* sp. (Verbenaceae) and *Leonotis leonurus* (Lamiaceae). During the wet season, it was not recorded at Sacta. Additionally, it was seen once during the wet season (February 2008) at Río Seco. These observations suggest that *H. cyanus* undertakes regional movements, which were previously unknown for this species (Hennessey *et al.* 2003).

RUFOUS-CRESTED COQUETTE *Lophornis delattrei*
A male was seen several times feeding on *Lantana* sp. (Verbenaceae) at Sacta in September 2008. This uncommon species otherwise is known in Bolivia only from records above 300 m elevation (Hennessey *et al.* 2003).

WHITE-BROWED HERMIT *Phaethornis stuarti*
This little-known species, one of the smallest hermits (Schuchmann 1999), was only found at Buena Vista, where no seasonal changes in its abundance were detected. *P. stuarti* was an inconspicuous species that did not vocalise much, often stayed in dense vegetation, and usually flew at <1.5 m above the ground. SA observed it feeding on *Erythrochiton fallax* (Rutaceae) and *Heliconia subulata* (Heliconiaceae) at heights of up to 1.5 m. During the dry season it was repeatedly seen taking insects from spider webs. This could be a sign of breeding activity, as Poulin *et al.* (1992) and Cotton (2007) found that breeding periods in many hummingbirds are related to peaks in arthropod availability during the dry season.

BUFF-BELLIED HERMIT *Phaethornis subochraceus*
This little-known species of restricted distribution (http://www.natureserve.org/infonatura/) was very common at Buena Vista in December 2007 and September 2008, and uncommon in the Botanical Garden in Santa Cruz in April and October 2008. It showed no obvious changes in abundance between seasons. *P. subochraceus* fed on a wide variety of plant species, among them *Amphilophium crucigerum* (Bignoniaceae), *Erythrochiton fallax* (Rutaceae), *Heliconia subulata* (Heliconiaceae), *Juanulloa* sp. (Solanaceae), *Marsdenia* sp. (Apocynaceae) and *Passiflora coccinea* (Passifloraceae). Usually, it perched low in the herb and shrub layer, but SA also observed the species feeding on epiphytes in the lower canopy, 6 m above ground. During the dry season few flowers were available at Santa Cruz, a possible reason for the low density of *P. subochraceus* at this site. At this season, *P. subochraceus* was observed collecting insects from the vegetation on several occasions. Young (1971) reported that Long-billed Hermit *P. longirostris* is mostly insectivorous during the dry season in Costa Rica, and the same might be true for *P. subochraceus* in Bolivia. At Buena Vista, *P. subochraceus* vocalised both in the dry and rainy seasons, but more noticeably in the latter season when two leks of 4–5 individuals each were found. At Santa Cruz, *P. subochraceus* only vocalised during the rainy season, but no leks were observed. Although these observations are unsystematic, they suggest that *P. subochraceus* breeds in the wet season.

FORK-TAILED WOODNYMPH *Thalurania furcata*
Probably the most widespread hummingbird species in South America (Schuchmann 1999), *T. furcata* was recorded at all study sites, including Corbalán in dpto. Tarija, from which department the species had not previously been reported (Hennessey *et al.* 2003). Here, it showed seasonal changes in abundance, being uncommon in the dry season in May 2008 but very common during the wet season in January 2008. At this time, *Stetsonia coryne,* a large cactus tree was mass flowering, and *T. furcata* took nectar by laterally piercing the flowers. Interestingly, all individuals observed at Corbalán were in immature or female plumage. Possibly this area represents a poor-quality habitat for the species, where due to competition only those individuals unable to occupy high-quality habitats occur. Similar observations were reported by Erwald & Rohwer (1980) for immatures of both sexes of Rufous Hummingbird *Selasphorus rufus*.

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A new subspecies of mountain tanager in the *Anisognathus lacrymosus* complex from the Yariguíes Mountains of Colombia

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SUMMARY.—A new subspecies of *Anisognathus lacrymosus* is described from Serranía de los Yariguíes in the East Andes of Colombia. The new taxon differs in a combination of plumage characters, including a darker back and crown, from the geographically proximate subspecies *A.l. tamae*, *A.l. pallididorsalis* and *A.l. olivaceiceps* of the East and Central Andes, as well as, on average, having a longer tail than other East Andes populations. The darker plumage of the new subspecies resembles that of *A.l. intensus* of the West Andes (which also occurs in more humid habitats), presenting a 'leap-frog' pattern of geographic variation. The new subspecies is restricted to *páramo* and stunted Andean ridgetop habitats, apparently being endemic to the Yariguíes massif. Analyses of biometrics, plumage and voice support species rank for *A.* (*lacrymosus*) *melanogenys* of the Santa Marta Mountains, as previously suggested by some authors. Subspecies *A.l. melanops*, *A.l. pallididorsalis*, *A.l. yariguierum* and *A.l. lacrymosus* represent phylogenetic species based on plumage, but a greater vocal sample is required to further analyse the rank of these and other populations.

Limits in the Thraupidae (tanagers) have recently been revised (e.g. Burns 1998, Remsen *et al*. 2009) and the family is now considered to be largely restricted to the Neotropics. Many species are brightly coloured and relatively easy to observe, factors which have led to the group being better studied than many other Neotropical bird families (e.g. Isler & Isler 1999).

The mountain tanager genus *Anisognathus* comprises two well-defined groups that have previously been treated in separate genera. 'Core' *Anisognathus* comprises Lachrymose (Lacrimose) Mountain Tanager *A. lacrymosus*, Scarlet-bellied Mountain Tanager *A. igniventris* and Santa Marta (Black-cheeked) Mountain Tanager *A. melanogenys*. In Colombia, these three species generally occur at higher elevations and in lower forest strata than congeners in primary habitats. Blue-winged Mountain Tanager *A. somptuosus* and Black-chinned Mountain Tanager *A. notabilis* are more robust birds with stronger flight and were previously treated as part of the genus *Compsocoma* (e.g. Hellmayr 1936, Zimmer 1944) but were lumped (with little justification) into *Anisognathus* by Meyer de Schauensee (1966). We treat *Compsocoma* as a subgenus of *Anisognathus* herein. *Anisognathus* is restricted to montane South America (Isler & Isler 1999) and has been considered related to various other montane tanager genera such as *Bangsia*, *Buthraupis*, *Chlorornis*, *Dubusia* and *Delothraupis* (Burns & Naoki 2004, Bleiweiss 2008).

Eight subspecies of *A. lacrymosus* are currently recognised, from Venezuela south to Bolivia (Dickinson 2003). These subspecies vary, among other characters, in: the shade of yellow-orange on the underparts; the shade of blue-grey on the crown, back, rump and flight feathers; facial plumage coloration; and the location, size and shape of yellow 'tear' marks on the head. Santa Marta Mountain Tanager *A. melanogenys* has sometimes been treated as conspecific with *A. lacrymosus*, as discussed further under 'Species limits'.

Here, we describe a new subspecies of *A. lacrymosus* recently discovered in the Yariguíes Mountains of Colombia (Donegan *et al.* 2007) and discuss geographical variation in the species in the northern Andes. Species limits and English names herein follow Salaman *et al.* (2009), with alternative names used by Remsen *et al.* (2009) also mentioned.

Methods

Field work.—Between January 2003 and January 2006, we and others studied eight primary forest sites at 150–3,200 m on both slopes of Serranía de los Yariguíes, an isolated western spur of Colombia's East Andes in dpto. Santander. The Yariguíes Mountains are isolated from the rest of the East Andes to the north and east by the dry Sogamoso and Suárez valleys, and to a lesser extent to the south by depressions associated with the ríos Horta, Quirola and Opón, and their tributaries, at least above the 2,500 m contour (Donegan *et al.* 2007).

Study sites were subject to 4–6 days' field work using mist-netting (up to 220 m of mist-nets) and observations including sound-recording and playback. The highest-elevation site studied on the west slope (Lepipuerto, on the upper río Chimera, El Carmen / Simacota municipality, 06°27′29″N, 73°27′27″W; 2,900 m) was accessed by helicopter in January 2005. Here, TMD mist-netted and photographed two individuals of *A. lacrymosus* and made various observations and sound-recordings. At another *páramo* site on the east slope of the massif studied six months later (Filo Pamplona, Galán municipality; 06°38′18″N, 73°24′32″W; 3,200 m), we mist-netted 11 individuals, made additional observations, and took photographs and blood samples (deposited at Universidad de los Andes). Because distribution maps in the major field guides for the region (Hilty & Brown 1986, Ridgely & Tudor 1989) showed *A. lacrymosus* to be widespread in Colombia's Eastern Andes, no special attention was paid to the species at the time.

On comparing our photographs with other texts (Fjeldså & Krabbe 1990, Isler & Isler 1999) and with specimens, it became apparent that the range of *A. lacrymosus* in the Eastern Andes is less widespread than sometimes stated and that the Yariguíes population showed plumage differences from all other Colombian populations, revealing an undescribed subspecies to be involved (Donegan *et al.* 2007, 2008). JEA collected specimens of the new subspecies at Alto Cantagallos, Finca Santo Domingo, San Vicente de Chucurí municipality, dpto. Santander on the west slope of the Yariguíes massif (06°48′49″N, 73°21′53″W; 2,450 m) on 9–13 November 2006 and at Filo Pamplona (details above) on 20–25 June 2008. In addition, we undertook joint field work at San Pedro de los Milagros, Antioquia, to collate additional data on *A.l. olivaceiceps* in January 2007. JEA also visited the Perijá Mountains to study *A.l. pallididorsalis* in July 2008 and TMD visited the Santa Marta Mountains to study *A. melanogenys* in January 2009 (see Appendix 1 for locality details).

Museum studies.—We or colleagues working with Project Biomap or at the Phelps collection (Caracas) examined museum specimens or photographs of specimens of *A. lacrymosus* and *A. melanogenys* in the institutions detailed in Appendix 1. We personally inspected or obtained photographs of all known East Andes and 'Bogotá' or 'Colombia' specimens. Soft-part colours and plumage descriptions were taken using codes in Munsell Color (1977, 2000) with blue and yellow hues from Smithe (1975). The following measurements were taken: wing-chord, tail length (to nearest 1 mm), tarsus length, culmen from skull to tip of upper mandible (to nearest 0.5 mm) and mass (g). Data from unsexed or juvenile birds, or those moulting measured feathers were excluded. Biometric data are presented in Appendix 2.

Plumage diagnosis and statistical tests for biometrics.—Subspecies limits were assessed following Donegan & Avendaño (2008) and Donegan (2008), using the following statistical approaches:

LEVEL 1: for biometrics, statistically significant differences at $p<0.05$ using an unequal variance (Welch's) *t*-test. A Bonferroni correction was applied for biometric data (five variables), to produce $p<0.01$. This test was not applied to assess plumage differences. The Level 1 calculation assesses statistical significance, but tolerates considerable overlap. Further calculations, described below, were undertaken to measure inter-population differences in the context of various species and subspecies concepts. In the formulae used below, $\bar{x}_1$ and s_1 are the sample mean and sample standard deviation of Population 1; $\bar{x}_2$ and s_2 refer to the same parameters in Population 2; and the t value uses one-sided confidence intervals at the percentage specified for the lower degree of freedom of the two populations for the relevant variable, with t_1 referring to Population 1 and t_2 referring to Population 2.

LEVEL 2: a '50% / 97.5%' test, following Hubbs & Perlmutter's (1942) now little-used subspecies concept, which is passed if sample means are two standard deviations or more apart, here defined as the sample mean of Population 1 falling outside the range of 97.5% of Population 2, controlling for sample size:

$|(\bar{x}_1 - \bar{x}_2)| > (s_1(t_{1\ @\ 97.5\%}) + s_2(t_{2\ @\ 97.5\%}))/2$. This test was not applied to assess plumage differences.

LEVEL 3: the traditional '75% / 99%' test for subspecies (Amadon 1949, Patten & Unitt 2002), modified to control for sample size:

$|(\bar{x}_1 - \bar{x}_2)| > s_1(t_{1\ @\ 99\%}) + s_2(t_{2\ @\ 75\%})$ and $|(\bar{x}_2 - \bar{x}_1)| > s_2(t_{2\ @\ 99\%}) + s_1(t_{1\ @\ 75\%})$

For plumage differences, this test was deemed satisfied for populations which are distinctive in plumage but which showed intergradation with geographically proximate populations.

LEVEL 4: for biometrics, diagnosability based on recorded values (first part of Isler *et al.*'s 1998 test and essentially equivalent to Cracraft's (1983) phylogenetic species concept). For phenotypic differences, Level 4 diagnosability was deemed to be satisfied for assumed allopatric populations that showed diagnosable differences based on available samples.

LEVEL 5: for biometrics, so-called '95% / 95%' diagnosability (i.e. 97.5% / 97.5%, given that the lower 2.5% of each population is also outside the range of each population). This occurs when sample means are four standard deviations apart, controlling for sample size, and is the second part of Isler *et al.*'s (1998) diagnosability test and also essentially equivalent to Cracraft's (1983) phylogenetic species concept:

$|(\bar{x}_1 - \bar{x}_2)| > s_1(t_{1\ @\ 97.5\%}) + s_2(t_{2\ @\ 97.5\%})$

For determining subspecies rank, Isler *et al.* (2006, 2007) suggested a 'full diagnosability for one character' test to diagnose subspecies of Thamnophilidae (Level 4 / 5 for at least one variable: essentially a phylogenetic species with small differences). The traditional test in ornithology for diagnosing subspecies is the Level 3 '99% / 75%' test. Stiles & Caycedo (2002) ranked allopatric populations with statistically significant means for different variables (Level 1) subspecifically. Where allopatric populations meet Levels 1, 3 and 4 / 5 for at least one character (i.e. satisfy all subspecies definitions), we proposed the description of new subspecies. Synonymy of subspecies was proposed only if allopatric populations failed to achieve any level of diagnosability (i.e. do not pass any subspecific definitions). Other putative subspecies are discussed but not described. This approach might produce inconsistency, because historically recognised but dubious taxa maintain their status, but similarly differentiated undescribed populations continue to lack nomenclatural status. However, this approach results in high thresholds for both new taxa and synonymy and permits maintenance of current taxonomic treatments for other populations pending molecular or other studies.

Vocalisations.—Sound-recordings were made using a Sony MiniDisc and Vivanco EM35 microphone, and have been deposited at the British Library (London), Banco de Sonidos Animales of Instituto Alexander von Humboldt (Villa de Leyva, Colombia), and at www.xeno-canto.org (XC). Due to the small number of recordings available for many populations, especially *A.l. tamae*, only subjective comparisons with vocalisations of other *Anisognathus* taxa were made.

Distribution modelling.—Data on localities for *A. lacrymosus* in Colombia were obtained from DATAVES, Fundación ProAves, Instituto Alexander von Humboldt and other sources (see Appendix 1). Locality data were geo-referenced for Colombian and Venezuelan localities using specimen data, publications in which records are found, data from observers, Paynter (1982, 1997) and other sources. All specimen, sound-recording, photographic and sight record localities were plotted, and models of potential distribution were constructed by J. Velásquez using MAXENT 3.0 (Phillips *et al*. 2006) based on climate data obtained from Worldclim (Hijmans *et al*. 2005). For most specimen localities, data were only available to the nearest minute. Minute accuracy was therefore used as a standard for geo-referencing all localities. This is considered a reasonable approach to ensure consistency within the dataset and in light of other constraints of such modelling, including the lack of actual (as opposed to modelled) climatic data for much of the northern Andes and the Yariguíes range in particular. Each species and subspecies was analysed separately, with the exception of *A.l. olivaceiceps*, *A.l. palpebrosus* and *A.l. caerulescens*, which are continuously distributed and were therefore analysed together. This approach resulted in analyses of the potential distributions of certain subspecies being based upon few localities. However, the modelling approach used herein is considered good for taxa with 20 or more localities and reasonable for taxa with *c*.5–20 localities (following Pearson *et al*. 2007). For taxa with fewer localities, the analysis is presented subject to caveats. The predicted ranges of each subspecies were then converted to presence-absence maps using a 20th percentile training presence threshold, which is the probability at which 20% of the training presence records are omitted. This threshold, although arbitrary, was chosen to avoid bias by outlying records or records geo-referenced inaccurately. Finally, predicted ranges for any subspecies or subspecies-group falling outside of regions continuous with known localities were excluded. The model was not refined to consider potentially suitable (e.g. non-modified) habitats.

Description

The population of *Anisognathus lacrymosus* occurring in Serranía de los Yariguíes is diagnosably distinct in plumage from all other subspecies. A new taxon that is a phylogenetic species (Cracraft 1983) or subspecies (Isler *et al*. 1998), in the sense of the tests set out above is clearly involved. We propose that it be named:

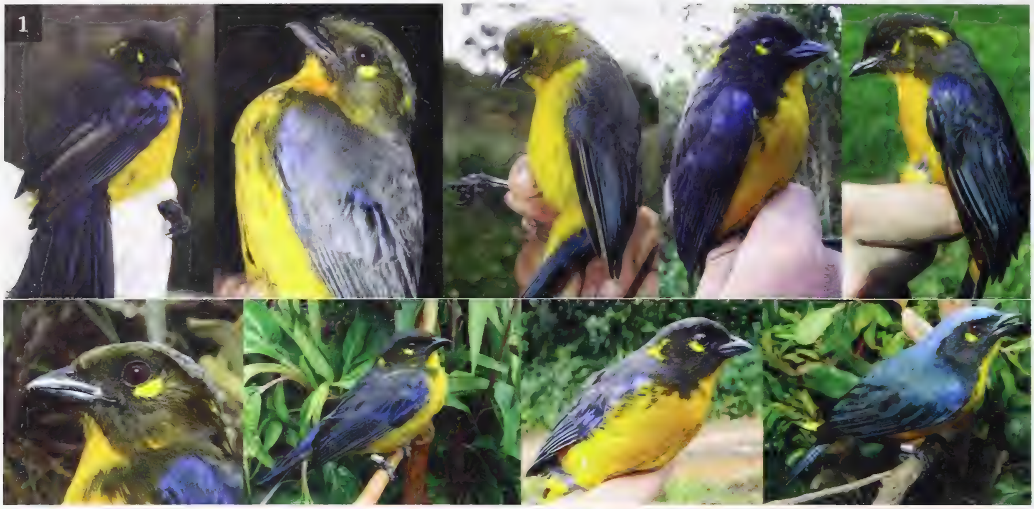
Anisognathus lacrymosus yariguierum subsp. nov.
Yariguíes Mountain Tanager

Holotype.—Instituto de Ciencias Naturales, Universidad Nacional, Bogotá, Colombia (ICN 36902). Adult male collected by Jorge Enrique Avendaño on 22 June 2008 (original number JEA-650) in *páramo* at Filo Pamplona above Finca La Aurora, municipality of Galán, dpto. Santander, Colombia (coordinates above) on the east slope of the Yariguíes massif, just below the main ridgeline. Skeleton with muscle and other soft tissue preserved in 70% ethanol deposited at Laboratorio de Biología Evolutiva de Vertebrados, Universidad de los Andes. Tissue samples have been deposited at the Banco de Tejidos of Universidad de los Andes (UniAndes-BT 700) and Banco de Tejidos of Instituto Alexander von Humboldt, Palmira, Colombia (IAVH-BT). The holotype is shown in Figs. 1(i), 2(iv) and 3(i).

Allotype and paratypes.—The type series is shown in Fig. 3. All were collected by Jorge Enrique Avendaño. The first is designated as an allotype, the others as paratypes. ICN 36903 / UniAndes-BT 701: (allotype) adult female captured at the type locality with the holotype and probably its mate (skull 100% ossified, follicular ovary 7.7 × 3.5 mm with largest follicle 0.5 mm, some subcutaneous fat in neck, furculum and flanks, 37 g, wing, tail and body moult); previously captured on 13 July 2005 at 13.30 h, and banded with ProAves ring no. C02784 (still on the specimen's leg). ICN 36911 / UniAndes-BT 702: immature male collected at the type locality on 23 June 2008 (skull ossification <50%, both testes yellowish, left testis 2.4 × 1.5, right testis 2.0 × 1.3, abundant subcutaneous fat in throat, neck, furculum, breast and dorsal regions, 38 g, wing and tail moult). ICN 36918 / UniAndes-BT 703: immature male collected at the type locality on 25 June 2008 (skull 30% ossified, left testis yellowish 1.7 × 1.5, right testis blackish 2.0 × 1.5, some subcutaneous fat in neck, furculum, flanks and back, 37 g, wing, tail and body moult). ICN 36920 / UniAndes-BT 704: juvenile female collected at the type locality on 26 June 2008 (skull 0% ossified, smooth ovary 3.0 × 2.7, abundant subcutaneous fat in throat, furculum and flanks, 32 g, negligible body moult). ICN 36176 / UniAndes-BT 546: adult female collected at Alto Cantagallos, San Vicente de Chucurí municipality on the west slope of Serranía de los Yariguíes (coordinates above) on 13 November 2006 (skull 50% ossified, follicular ovary 6.2 × 3.2 with largest follicle 1.7 mm, some subcutaneous fat in neck and furculum, 35 g, wing and body moult). Tissue samples of the allotype and paratypes have also been deposited at IAVH-BT.

Diagnosis.—*A.l. yariguierum* is clearly a member of the genus *Anisognathus* and the *A. lacrymosus* species-group on the basis of its plumage (e.g. Fig. 2), vocalisations (e.g. Figs. 5–6) and biometrics. It differs from *A.l. tamae* of the East Andes, *A.l. pallididorsalis* of the Perijá Mountains and *A.l. olivaceiceps* of the northern Central Andes in its darker and bluer crown, darker mantle, darker blue rump and shoulder, and darker face with less strong yellowish tones. It differs further from *A.l. tamae* and *A.l. pallididorsalis* in its darker tail and less extensive blue markings on the rectrices. The new subspecies differs from *A.l. melanops* of the Venezuelan Andes in having darker upperparts. The head and mantle of the new subspecies are closer to *A.l. intensus*, which occurs in the southern West Andes of Colombia. However, *A.l. yariguierum* differs from the latter subspecies in its more bluish crown, face, nape and mantle. Compared to *A.l. palpebrosus* of Ecuador and southernmost Colombia, and the southern races *A.l. caerulescens* and *A.l. lacrymosus*, it has a bluer crown, darker back, darker blue rump, darker yellow underparts, and darker blue primary remiges. It can be separated from *A. melanogenys* by the presence of a yellow 'tear' on the nape, the darker blue crown and blue (not greenish) back, tail and wing, and shorter bill. It lacks the red underparts of Scarlet-bellied Mountain Tanager *A. igniventris* and has less extensive black feathering on the upper breast. Members of the subgenus *Compsocoma* do not closely resemble *A.l. yariguierum*.

Description of the holotype.—Crown dark bluish (73, Indigo). Sides of head and moustachial region dark, with faint yellowish tinge (5YR 2.5/2). Elongated, tear-shaped spots below eye and below and behind ear-coverts dark yellow (18, Orange Yellow). Mantle dark grey with hint of blue (Gley 2, 3/5 PB but bluish). Rump and shoulder feathers tipped blue (between 70, Smalt Blue and 71, Campanula) with unexposed dusky bases resulting in overall blue coloration over this region. Tail dusky (10YR 2/1) with outer remiges faintly tipped blue (as flight feathers). Outer remiges of alula and all wing-coverts tipped blue (as rump) otherwise dusky (10YR 2/1). Primaries, secondaries and tertials dusky (10YR 2/1) with outer remiges, except the outermost primary, tipped light blue (66, Sky Blue, slightly darker on tertials). Underparts orange-yellow (closest to 18, Orange Yellow, but darker), feathers being dusky (10YR 2/1) at base, with darker feathering exposed only slightly on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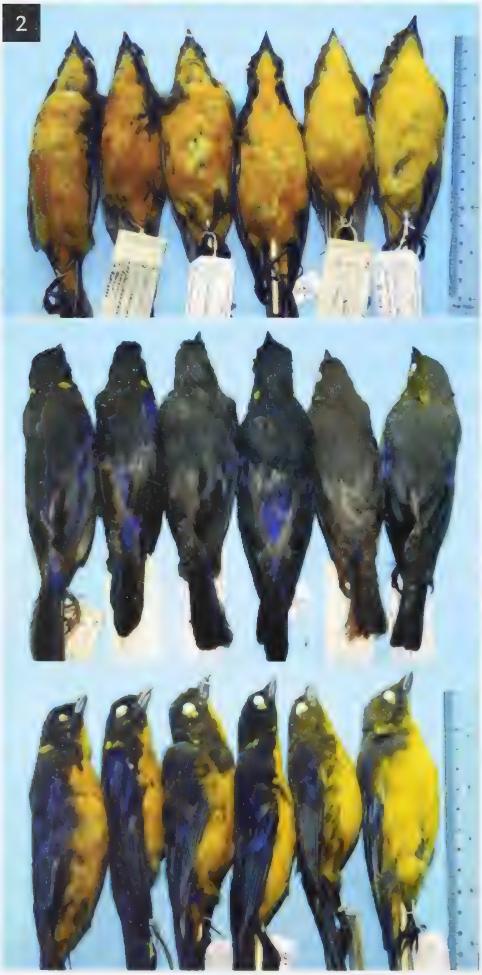
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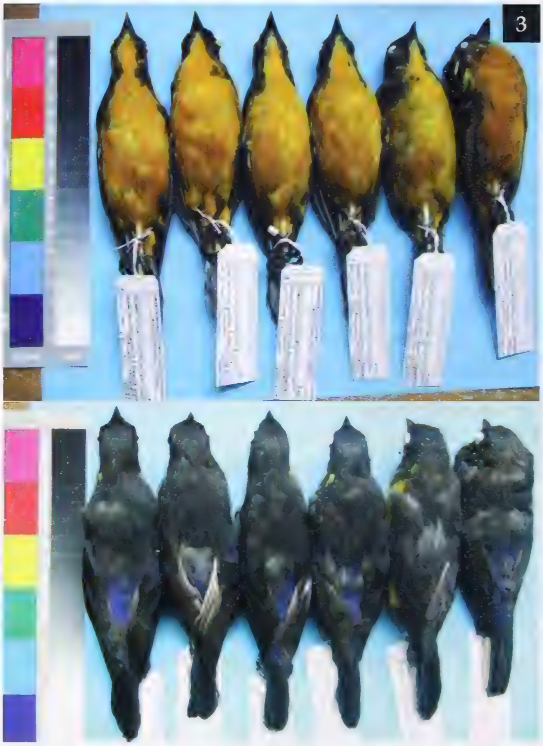
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flanks and tibia. Irides dark brown, bill black, tarsi, feet and nails black-brown, soles dark ochre. Flattened wing (after collection) 92.2 mm, tail 77.3 mm, tarsus 26.0 mm, culmen to skull 16.4 mm, bill depth (at nostrils) 6.2 mm, bill width (rictus) 11.6, mass 35 g. Fairly extensive subcutaneous fat in dorsal, furculum and neck regions. Body moult restricted to a few feathers in crown, nape, throat, breast, belly and uppertail-coverts, wing moult broadly symmetrical with emergent ninth and eighth primaries on both wings, second to fourth and sixth secondaries on left wing and third, fourth and seventh secondaries on right wing. Tail moult also broadly symmetrical with emergent second and fourth rectrices from outermost on the left side and third and fourth rectrices on the right side. Stomach contents included digested plant material and seeds. Skull 100% ossified. Left testis: 5.0 × 2.5 mm; right testis 4.4 × 2.2 mm.

Variation.—All specimens are essentially identical to the holotype with the following exceptions. Compared to the other specimens, ICN 36920 (a juvenile female) is dorsally duller and more yellowish ventrally. ICN 36176 has more orange underparts compared to the rest (midway between 17, Spectrum Orange and 18, Orange Yellow), resembling *A.l. intensus* even more closely (Fig. 3). Differences between this specimen and the rest of the type series are more notable in photographs than when compared visually. The variation in underparts coloration could represent either individual or geographical variation within *A.l. yariguierum*. The darker breasted specimen was taken 23 km north of the type locality. Birds photographed and released from the southernmost site (Lepipuerto), which like the darker bird were collected on a west-facing slope, are similar in plumage (including underparts coloration) to Filo Pamplona specimens. A juvenile mist-netted and released at Filo Pamplona had a yellowish gape. See Appendix 2 for variation in biometrics.

Distribution.—Fig. 4 shows the localities at which *A.l. yariguierum* has been recorded and the range of *A. lacrymosus* in the northern Andes. *A.l. yariguierum* has been found to date only in Serranía de los Yariguíes, where it is confined to the highest-elevation *páramos* and *subpáramos*. *Páramo* habitats of the Yariguíes Mountains have no connectivity with such habitats elsewhere in the East Andes (Fig. 4). Other recently described taxa including *Scytalopus griseicollis gilesi* (Donegan & Avendaño 2008), *Grallaricula nana hallsi* (Donegan 2008) and the butterfly *Idioneurula donegani* (Huertas & Arias 2007) are also apparently endemic to such

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Figure. 1 (top). From left to right and top to bottom (i) Holotype of *Anisognathus lacrymosus yariguierum* (J. E. Avendaño); (ii) *A.l. tamae*, Alto Pesebre, Tamá National Park, Herrán, Norte de Santander, East Andes, Colombia (A. M. Cuervo); (iii) *A.l. pallididorsalis*, vereda Sabana Rubia, Manaure, Cesar, Perijá, Colombia (J. E. Avendaño); (iv) *A.l. melanops*, Dinira National Park, Lara, Mérida, Venezuela (J. E. Miranda T.); (v) *A.l. olivaceiceps*, vereda La Lana, San Pedro de los Milagros, Antioquia, Central Andes, Colombia (T. M. Donegan / B. Huertas / J. E. Avendaño); (vi) *A.l. olivaceiceps*, West Andes population, Reserva Natural de Aves Colibrí del Sol, Urrao, Antioquia (A. Quevedo / ProAves); (vii) *A.l. palpebrosus*, Reservas de Aves Comunitarias, Roncesvalles, Tolima (A. Quevedo/ProAves); (viii) *A.l. intensus*, Munchique National Park, El Tambo, Cauca, West Andes, Colombia (Juan Pablo López); (ix) *A. melanogenys*, Reserva Natural de Aves El Dorado, Santa Marta, Magdalena, Colombia (C. Olicaregui / ProAves)

Figure 2 (lower left). Colombian subspecies of *A. lacrymosus*, from left to right: (i) *A.l. palpebrosus* ICN 2816 (La Cocha, Nariño, southern Colombian Andes, collected 2 February 1950 by J. I. Borrero); (ii) *A.l. intensus* ICN 25790 (Farallones de Cali (Alto Pato), Valle del Cauca, Western Andes, collected 29 July 1980 by H. Romero-Z *et al.*), (iii) *A.l. olivaceiceps* ICN 35001 (Alto Ventanas, Jardín, Antioquia, Central Andes, collected 25 February 2004 by G. Suárez), (iv) *A.l. yariguierum* ICN 36902 (holotype), (v) *A.l. tamae* ICN 18191 (Páramo de Tamá, Toledo, Norte de Santander, Eastern Andes, collected 15 August 1968 by P. Bernal) and (vi) *A.l. pallididorsalis* ICN 36781 (vereda El Cinco, Manaure, Cesar, Perijá, collected 12 July 2008 by J. E. Avendaño) (J. E. Avendaño)

Figure 3 (lower right). Ventral and dorsal views of the *A.l. yariguierum* type series. From left to right: (i) ICN 36902 (holotype), (ii) ICN 36918 (paratype); (iii) ICN 36903 (allotype); (iv) ICN 36911 (paratype); (v) ICN 36920 (paratype); (vi) ICN 36176 (paratype) (T. M. Donegan) habitats in Yariguíes, and possess essentially identical distributions to *A.l. yariguierum* (see maps in references cited above).

Our own rainfall readings taken in the field and data in Worldclim (Hijmans *et al.* 2005) reveal higher levels of precipitation for sites where *A.l. yariguierum* is predicted to be present in Serranía de los Yariguíes than the average for sites of similar elevation in the East Andes (mean 1,400 vs. 1,900 mm / p.a.: Donegan & Avendaño 2008).

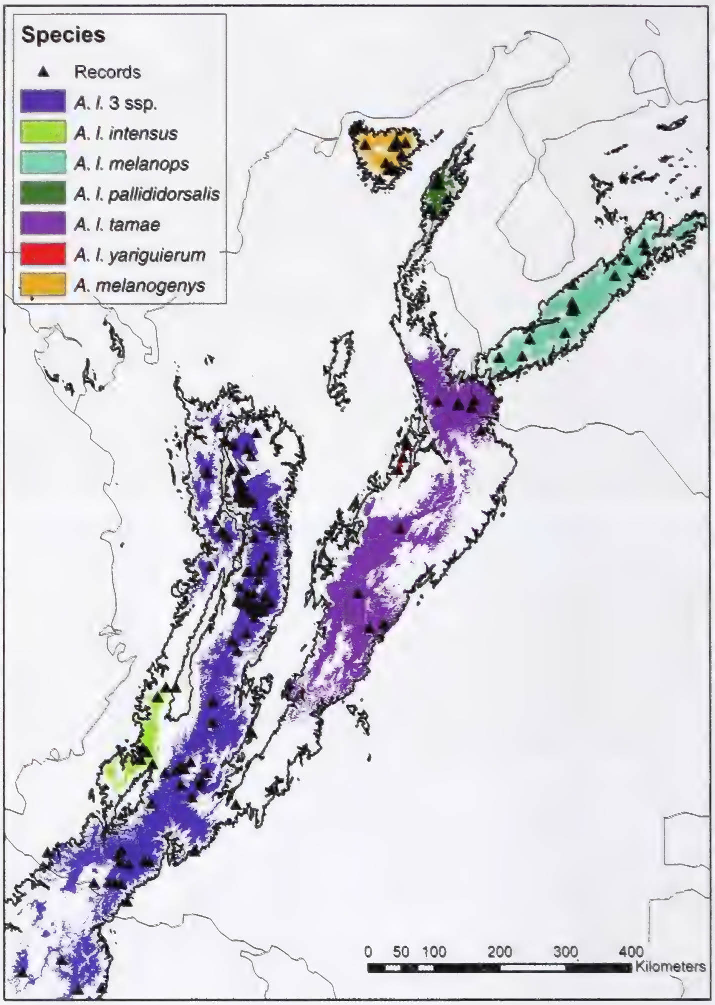

Figure 4. Potential distribution map showing records and modelled potential distribution of *A. lacrymosus* subspecies and *A. melanogenys* in the Colombian Andes.

Geographically proximate *A.l. tamae* is found elsewhere in the East Andes but is rare in collections, with few recent observations and is little known in life. Its absence from many localities in the East Andes and the small number of specimens and recent observations are surprising given that *A.l. olivaceiceps* / *palpebrosus* of the Central Andes is so widespread and common.

Elsewhere in Colombia, *A. lacrymosus* is also found in *páramos*, in shrubby, young regrowth in montane forest and at forest borders at lower elevations. *A. somptuosus* occurs in Serranía de los Yariguíes and elsewhere throughout the Colombian Andes at lower elevations in montane and premontane forest. In the Central Andes, *A. somptuosus* and *A. lacrymosus* are sympatric in secondary forest, but appear to segregate according to habitat use, with the former found more frequently in higher forest strata and the latter generally in lower forest strata or in stunted vegetation. Both species occur at forest borders.

Vocalisations.—Several sound-recordings were made at Lepipuerto (e.g. Figs. 5A, 5B, 5F, 6A, 6B). These have been deposited at the British Library, London, and Instituto Alexander von Humboldt in Colombia and at www.xeno-canto.org nos. XC37291–37303 and XC37310. *A. lacrymosus* taxa possess a varied repertoire of calls and songs. Unlike suboscines (e.g. Kroodsma 1984), oscine vocalisations are not innate and may have a learned component (i.e. they might be affected by environmental factors). As a result,

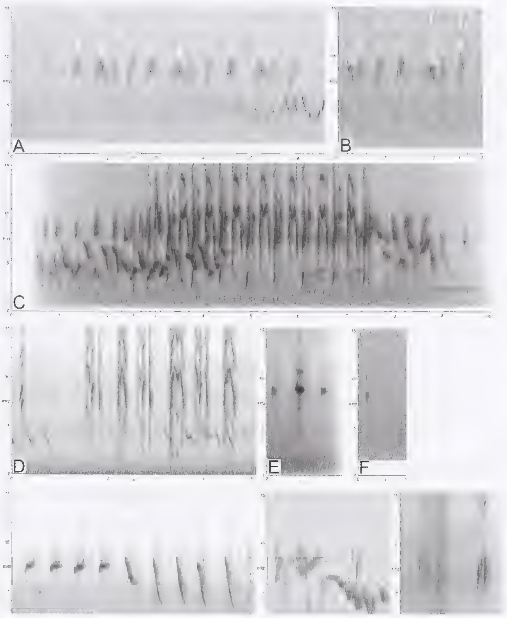

Figure 5 (top). Sonograms of songs of (A) *A.l. yariguierum*, Lepipuerto, Serranía de los Yariguíes (T. M. Donegan: XC 37295), with calls below *c.*7.5 kHz of Golden-fronted Whitestart *Myioborus ornatus*; (B) As previous (XC 37291); (C) *A.l. palpebrosus*, Neira, La Cristalina, upper río Tapías, Caldas (A. M. López *in* Álvarez *et al.* 2007), with calls below 8 kHz of *Myioborus ornatus*; (D) *A.l. caerulescens*, Tapichalaca, Zamora-Chinchipe, Ecuador (N. Krabbe *in* Krabbe & Nilsson 2003), with calls below 6 kHz probably of Yellow-breasted Brush Finch *Atlapetes latinuchus*. Sonograms of: (E) *A.l. olivaceiceps* contact call, Antioquia, Colombia (Alvarez *et al.* 2007); (F) *A.l. yariguierum* contact call, Lepipuerto, Serranía de los Yariguíes (T. M. Donegan XC 37310); (G) *A.l. caerulescens* dawn song, Cajanuma, Loja, Ecuador (P. Coopmans *in* Krabbe *et al.* 2001); (H) *A.l. palpebrosus*, Pasto, Nariño, Colombia (O. Laverde: XC 17800); (I) *A. melanogenys* flight call, then call, Reserva Natural de Aves El Dorado, Magdalena, Colombia (T. M. Donegan: XC 37290).

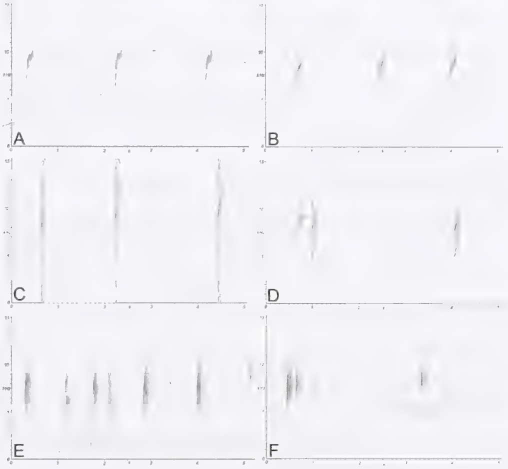

Figure 6 (bottom). Sonograms of calls of (A) *A.l. yariguierum*, Lepipuerto, Serranía de los Yariguíes, Santander, Colombia (T. M. Donegan: XC 37298); (B) As previous (XC 37299); (C) *A.l. melanops*, Guaracamal National Park, Trujillo, Mérida, Venezuela (Boesman 1999); (D) *A.l. pallididorsalis*, El Cinco, Manaure, Cesar, Colombia (J. E. Avendaño); (E) *A.l. palpebrosus*, río Blanco, Manizales, Caldas (M. Álvarez *in* Álvarez *et al.* 2007); (F) *A. melanogenys*, Reserva Natural de Aves El Dorado, Magdalena, Colombia (Krabbe 2008a).

voice has been little-used to assess species limits in oscines, and tanagers in particular, although there are some recent studies (see e.g. Cadena *et al.* 2007) and vocalisations must possess some innate component as otherwise species would not have different voices. *Anisognathus lacrymosus*, like many oscines, has a variable repertoire (Figs. 4–5).

The song of *A.l. yariguierum* consists of a 2–8 seconds-long, rapidly delivered series of sharp, high-pitched notes, upstrokes and up-down strokes, at *c.*7.5–10.5 kHz (Figs. 5A–5B). Similar songs are given by *A.l. olivaceiceps*, *A.l. palpebrosus* and possibly some other subspecies (Fig. 5). *A.l. yariguierum* appears to show more deep downstrokes within phrases than that shown on recordings of some other taxa. It is unknown whether differences in note shape reflect individual or geographical variation.

The calls of *A.l. yariguierum* (Figs. 6A–6B) comprise a series of repeated high-pitched, short whistles *suip* with long gaps between them. Each whistle appears on the sonogram as a short, rising, broken, upstroke at *c.*5–11 kHz and is *c.*0.1–0.2 seconds-long. Calls are repeated at irregular intervals and vary in note shape. Similar calls of *A.l. palpebrosus* (Fig. 6E) appear less broken in note shape, whilst available recordings of this call in *A.l. melanops* (Fig. 6C) and *A.l. pallididorsalis* (Fig. 6D) show variations in note shape (e.g. *suip-iu* in *A.l. melanops*).

We also recorded a contact call of *A.l. yariguierum* (Fig. 5F), consisting of a soft single note of at *c*.8–9 kHz, similar to a recorded call of *A.l. olivaceiceps* (Fig. 5E).

Intriguingly, songs of several subspecies of *A. lacrymosus* (including *A.l. yariguierum*) are delivered simultaneously with the song of nearby individuals of Golden-fronted Whitestart *Myioborus ornatus*, *Atlapetes* brush finches and other species that use lower acoustic frequencies (Figs. 5A, 5C, 5D).

Biometrics.—*A.l. yariguierum* is not diagnosable beyond Level 2 in biometrics from any *A. lacrymosus* taxa, with overlap noted for all variables (Appendix 2). However, based on specimen data, the new subspecies has, on average, a longer tail compared to *A.l. melanops* (Levels 1 and 2), *A.l. tamae* (Level 1), *A.l. caerulescens* (Levels 1 and 2) and *A.l. lacrymosus* (Levels 1 and 2). Based on data from live birds, it further appears to have an on average shorter tail than *A.l. olivaceiceps* (Level 1) and *A.l. palpeborus* (Levels 1 and 2). The other Colombian populations (*A.l. pallididorsalis* and *A.l. intensus*) also showed small differences in tail length from *A.l. yariguierum*, but did not meet the requirements of our Level 1 test based on specimen data ($0.01<p<0.05$ in each instance) and no data from live birds were available. *A.l. yariguierum* may also have, on average, a longer tarsus than *A.l. pallididorsalis* (specimen data: Levels 1 and 2) and *A.l. palepbrosus* (data from live birds: Level 1) and a longer culmen compared to *A.l. tamae* (specimen data: Level 2), *A.l. pallididorsalis* (specimen data: Levels 1 and 2), *A.l. olivaceiceps* (data from live birds: Level 1) and *A.l. palpebrosus* (data from live birds: Level 1), although observed differences in these two measurements are very small.

Ecology.—*A.l. yariguierum* has been recorded only in pristine primary *páramo* and ridgetop habitats 2–30 km from settlements. Such sites are subject to very high levels of precipitation, with torrential rain lasting several hours each day of field work and frequent ground-level cloud cover. The new taxon is absent from taller montane or other forest at lower elevations. Birds are often quite visible. In July 2008 and June 2005, small flocks were observed and individuals with gape lines mist-netted. In contrast, only pairs were seen in January 2005. Such behaviour is consistent with nesting in March–April, as is apparently the case for various other species in the Yariguíes region. Ossification and gape line data indicate that adult plumage is attained very rapidly. No specimens of any *A. lacrymosus* races with distinct juvenile or immature plumages were found in collections. We observed *A.l. yariguierum* following mixed-species flocks of Streaked Tuftedcheek *Pseudocolaptes boissonneautii*, Golden-fronted Whitestart *Myioborus ornatus*, Golden-crowned Tanager *Iridosornis rufivertex* and Common Bush Tanager *Chlorospingus ophthalmicus*. *A. lacrymosus* was also observed joining flocks at forest borders in San Pedro de los Milagros (Antioquia: *olivaceiceps*), Manaure (Cesar: *pallididorsalis*) and Suratá (Santander: *tamae*).

Conservation.—*A.l. yariguierum* is endemic to the Colombian East Andes EBA (038: Stattersfield *et al*. 1998). It qualifies for IUCN Category D2 Vulnerable status due to its Area of Occupancy being less than 100 km^2 and being known from fewer than five localities. The new subspecies is rather common in *páramo* and ridgetop habitat. Following our work and with the impetus of the Ministerio de Medio Ambiente, Corporación Autónoma Regional de Santander (CAS), various mayoralties of the region and NGOs, the Serranía de los Yariguíes National Park was declared in May 2005. The protected area covers all *páramo* habitats of the range and should assist in conserving *A.l. yariguierum* and other threatened species (see Donegan & Huertas 2005, Huertas & Donegan 2006). This description does not affect the current IUCN status of *A. lacrymosus* as Low Risk.

Etymology.—The subspecific name, *yariguierum*, to be treated as a noun declined in the genitive plural, which need not agree in gender with the generic name in combination under Art. 31.2.2 of the International Code of Zoological Nomenclature (ICZN 1999). The name honours the extinct Yariguíes indigenous people and the massif that bears their name, to which *A.l. yariguierum* is apparently restricted. Further details are given in Donegan & Huertas (2006).

Use of genus name Anisognathus.—Three genus names for birds in what is currently known as *Anisognathus* were described between the years 1850 and 1852: *Anisognathus* Reichenbach, 1850 / 52; *Compsocoma* Cabanis, 1850 / 51 and *Poecilothraupis* Cabanis, 1850 / 51. The date of publication of these names and priority appears not have been subject to detailed study. Use of the generic name *Anisognathus* herein follows prevailing treatments in modern Neotropical ornithological publications.

Geographic variation in Anisognathus lacrymosus.—*A. lacrymosus* includes a number of morphologically different populations found throughout the tropical Andes. It has relatively poor flight for a tanager, making the group excellently suited to studies of speciation and biogeography. However, few authors since Zimmer (1944) have studied geographical variation in the species. Graves (1985) categorised *A. lacrymosus* as exhibiting 'smooth clinal' variation, which is an over-simplification and appears true only of some populations. In contrast, Krabbe *et al.* (2006) discussed the intriguing presence of two rather different subspecies (*A.l. olivaceiceps* and *A.l. intensus*) in the West Andes of Colombia: 'There is indirect evidence that colonisation of the Western Andes in some cases happened by jump dispersal across the Cauca Valley rather than through continuous suitable habitat. One form of Lacrimose Mountain-Tanager (*Anisognathus lacrymosus olivaceiceps*) occurs in the north ends of both cordilleras, whereas the form *palpebrosus* is found further south in the Central Andes and the form *intensus* further south in the Western Andes (to which it is endemic).' Field work within the apparent distribution 'gap' between Risaralda and Valle in the West Andes is needed to consider further the nature of geographic variation in the West Andes.

Graves (1985), Zimmer (1944) and Ridgely & Greenfield (2001) all describe clinal variation in *A. lacrymosus* from northern Peru through Ecuador to the Central Andes of Colombia. Three subspecies occur in this region, from north to south: *olivaceiceps* (type locality: Santa Elena, Antioquia, Colombia), *palpebrosus* (type locality: Pasto, Nariño, Colombia) and *caerulescens* (type locality: Cutervo, Cajamarca, Peru). Our museum work leads us to conclude that *A.l. olivaceiceps* could be recognised under subspecies concepts that permit intergradation or admit taxa that are not wholly diagnosable (e.g. Amadon 1949, Patten & Unitt 2002). Specimens from both the West Andes and Central Andes of Antioquia are consistent in plumage, having a greyer face and paler mantle than specimens from further south. There is a region of intergradation between this subspecies and birds treated as *A.l. palpebrosus* in Tolima (e.g. Fig. 1v), which themselves differ in plumage saturation from Nariño specimens. The proposition that *A.l. caerulescens* represents a valid subspecies with respect to *A.l. palpebrosus* under subspecies concepts based on any of our Levels 2 to 5, is not supported. However, our Level 1 test was passed as between populations north and south of the southern Tungurahua border in Ecuador (*c.*01°30'S) for tail length based on specimens, and a region of less suitable habitat was predicted in this region by distribution modelling, so we do not formally propose synonymy. There are plumage differences between individuals from the two type localities, but Zimmer (1944) described in detail a gradual shift in a number of these plumage features between these localities, describing it as 'perfect intergradation'. Only one of these three subspecies (*palpebrosus* being senior) would be recognised under subspecies concepts based on full diagnosability (e.g. Zink 2003).

In contrast, the northern races *A.l. pallididorsalis* (Perijá), *A.l. melanops* (Mérida) and *A.l. yariguierum* (Yariguíes), as well as the southernmost *A.l. lacrymosus* (Peru, south of the Marañón Valley) have allopatric distributions with respect to other *A. lacrymosus* taxa and are diagnosable in plumage from other populations. They all represent phylogenetic species (Cracraft 1983) and meet all subspecies definitions considered here. The sole *A.l. melanops* recording available has a higher frequency than equivalent calls in other subspecies (Fig. 6C) and shows small differences in note shape from other recordings of northern races (Figs. 5–6). *A.l. pallididorsalis* further shows differences up to Level 2 in bill length from all other races except *A.l. tamae* and *A. l. lacrymosus*. Some of these populations or groups thereof might be considered candidates for species rank under some species concepts. However, a thorough vocal study (and greater vocal sample) is needed to consider species limits further. The taxon to which East Andes populations have been assigned, *A.l. tamae*, is unknown vocally but darker individuals within this subspecies are virtually indistinguishable from paler individuals of *A.l. olivaceiceps*. The generally greater differentiation in plumage (and, apparently, voice) in the north of the species' range and presence of *A. melanogenys* in the Santa Marta Mountains is notable and may inform hypotheses concerning the group's radiation.

The darker plumage shared by *A.l. yariguierum* of the East Andes (Yariguíes) and *A.l. intensus* of the West Andes, compared to the paler plumage shared by *A.l. tamae* of the East Andes and *A.l. olivaceiceps* of the Central Andes are intriguing examples of a 'leap-frog' pattern in geographic variation (Remsen 1984). As the Yariguíes Mountains and West Andes share higher levels of precipitation than nearby regions where paler subspecies are found, darker plumage might be a convergent adaptation, conforming to Gloger's Rule (Zink & Remsen 1986). Other possible processes not tested here could explain the pattern observed (e.g. common ancestry) although it would be surprising if *A.l. intensus* and *A.l. yariguierum* were sister populations given that various other *A. lacrymosus* taxa have geographically more proximate distributions.

Species limits.—*A. melanogenys* has been treated as a subspecies of *A. lacrymosus* by some authors (e.g. Hellmayr 1936, Zimmer 1944, Storer 1970, Isler & Isler 1999) or as part of a superspecies together with *A. lacrymosus* (Sibley & Monroe 1990). Our analyses support maintaining species rank for *A. melanogenys* (following, e.g., Meyer de Schauensee 1964, 1966, Hilty & Brown 1986, Fjeldså & Krabbe 1990, Ridgely & Tudor 1994, 2009, Dickinson 2003, Restall *et al*. 2006, Remsen *et al*. 2009, Salaman *et al*. 2009). *A. melanogenys* has a longer bill than *A. lacrymosus*, with a different, more elongated shape (Fig. 1). This measurement is diagnosable to Level 5 from proximate populations, *A.l. melanops*, *A.l. pallididorsalis* and *A.l. tamae* (and *A.l. lacrymosus*), and to Level 2 from other races of *A. lacrymosus*. The tarsus length of *A. melanogenys* is also diagnosable up to Level 3 from geographically proximate *A.l. pallididorsalis*. In contrast, there are no differences beyond Level 2 for any measurements among current *A. lacrymosus* subspecies. In plumage, the combination of a cerulean blue crown and absence of a yellow nuchal 'tear' in *A. melanogenys* involves differences in both pattern and coloration from all *A. lacrymosus* taxa. *A. melanogenys* further lacks strong blue feathering on its rump and has paler yellow underparts, and greener-blue upperparts and remiges compared to *A. lacrymosus* (Fig. 1). *A. melanogenys* calls have a consistently different note shape compared to *A. lacrymosus* populations, being delivered faster and appearing as virtually a straight line (as opposed to an upstroke or up-down stroke) on sonograms (Figs. 5I, 6F). The Santa Marta Mountains are isolated geographically from the Andes and harbour a number of endemic high-elevation birds considered specifically distinct from populations in the Andes (e.g. Krabbe 2008b), of which *A. melanogenys* appears to be an example. In contrast, although various allopatric *A. lacrymosus* taxa constitute phylogenetic species (based on plumage), none are known to occur in sympatry and morphological differences between populations do not approach the differentiation shown between *A. melanogenys* and other taxa. As a result, we recommend maintaining species rank for *A. melanogenys* and *A. lacrymosus*, with no further splits for now, under the Biological Species Concept.

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APPENDIX 1: Materials examined

Specimen data are organised alphabetically by museum, then in number order by specimen number. Other data are organised from south to north. Elevations are only presented when given on specimen labels and, if given in feet, have been converted to metres. Assignment of specimens or observations to subspecies in the Central Andes is based upon arbitrary segregation between (i) Central Andean populations of *A.l. palpebrosus* and *A.l. olivaceiceps* near the Caldas–Antioquia border (*c*.05°30′–06°00′N), where there is a gap in records; and (ii) between *A.l. palpebrosus* and *A.l. caerulescens* at the latitude of the southern Tungurahua border (*c*.01°30′S) in central Ecuador.

Specimens

The following museum codes are used in this section. Museums marked * were visited by the authors, with other specimen data from Biomap, which were confirmed with photographs in instances noted below. AMNH* = American Museum of Natural History, New York, USA. ANSP = Academy of Natural Sciences, Philadelphia, USA. BMNH* = Natural History Museum, Tring, UK. CM = Carnegie Museum of Natural History, Pittsburgh, USA. CMUC = Centro de Museos, Universidad de Caldas, Manizales, Colombia. COP = Colección Ornitológica Phelps, Caracas, Venezuela. CZUT* = Colección Zoológico, Universidad de Tolima. FMNH = Field Museum of Natural History, Chicago, USA. FVZ = Western Foundation of Vertebrate Zoology, Caramillo, USA. IAVH* = Instituto Alexander von Humboldt, Villa de Leyva, Colombia. ICN* = Instituto de Ciencias Naturales, Universidad Nacional, Bogotá, Colombia. INCIVA = Instituto Vallecaucano de Investigaciones, Cali, Colombia. LACM = Los Angeles County Museum of Natural History, Los Angeles, USA. LSU = Museum of Natural Science, Louisiana State University, Baton Rouge, USA. MCSJ = Museo Colegio San José, Universidad de la Salle, Medellín, Colombia. MHNNL = Muséum d'Histoire Naturelle de Neuchâtel, Neuchâtel, Switzerland. MLS* = Museo de la Universidad de la Salle, Bogotá, Colombia. MNHN* = Muséum Nationale d'Histoire Naturelle, Paris, France. MHNG = Museum d'Histoire Naturelle de Genève, Geneva, Switzerland. MHNUV* = Museo de Historia Natural, Universidad de Valle, Cali, Colombia. MHNUC* = Museo de Historia Natural, Universidad del Cauca, Popayán, Colombia. MVZ = Museum of Vertebrate Zoology, University of California, Berkeley, USA. UMMZ = Museum of Zoology, University of Michigan, Ann Arbor, USA. SMF = Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt, Germany. USNM = Smithsonian Institution, National Museum of Natural History, Washington, USA. YPM = Peabody Museum of Natural History, Yale University, USA. ZMB = Museum für Naturkunde der Humboldt Universität, Berlin, Germany. ZSM = Zoologische Staatssammlung, München, Germany.

A. melanogenys SANTA MARTA, COLOMBIA: AMNH 72429, 72481–85 (El Líbano, Magdalena, 11°10′N, 74°00′W), 72479–80, 72486–88 (San Lorenzo, Magdalena, 11°10′N, 74°07′W); BMNH 1885.6.7.29 (Templado, Valledupar, Cesar, 1,981 m, 10°33′N, 73°29′W), 1885.6.7.30–31 ('nr. San Sebastián' [de Rabago, Valledupar, Cesar], 10°34′N, 73°36′W); CM 29072 (San Lorenzo, as above, photograph); ICN 2168–69, 23466–72, 23474, 23476–78, 23480–83 (San Lorenzo, as above), 23484 (Cuchilla Cebolleta, Ciénaga, Magdalena, 10°55′N, 73°55′W); MNHN 6406 / CG1932 / 1340 ('Santa Marta'). *Biomap*: ANSP 63234–38, 184423 (San Miguel, Dibulla, La Guajirá, 10°58′N, 73°29′W); CM 8820, 8826 (El Líbano, as above), 37800–02, 37919, 37942, 37959–60, 37971, 37984–85, 42541, 102869–70 (San Lorenzo, as above), 38642–45, 38662, 39659 ('Santa Marta'"), 45042 (Alto de Chirua, Riohacha, La Guajirá, 10°56′N, 73°22′W), 45072–73, 45084 (río Macotama, Dibulla, La Guajirá, 10°55′N, 73°30′W); FMNH 72773–74 (San Lorenzo, as above); LSU 90464–65 (San Lorenzo, as above); MCZ 106392–93, 106395–99, 106401–05, 106407–09 (Macotama, as above); SMF 59900 (San Lorenzo, as above), 72484 (El Líbano, as above); USNM 170370–01 (Macotama, as above), 346926, 388186–87 (Chenducua, Valledupar, Cesar, 10°47′N, 73°25′W), 375135, 388197–202, 388204–05 ('Santa Marta'), 384373–80, 388184–85 (San José, Valledupar, Cesar, 10°45′N, 73°24′W), 388181–83 (río Guatapurí, Valledupar, Cesar, 10°53′N, 73°32′W), 388188 (Cerro el Mamón, Valledupar, Cesar, 10°37′N, 73°33′W), 388191–96 (Chinchicua, Puerto Bello, Cesar, 10°26′N, 73°43′W), 388296, 388207–10 (Siminchucua, Aracataca, Magdalena, 10°40′N, 73°38′W).

A.l. pallididorsalis SERRANÍA DE PERIJÁ, VENEZUELA: AMNH 55591 (Cerro Tetarí, Zulia, Perijá, 10°02′N, 73°02′W, 2,900 m); COP 55586–602 (Cerro Tetarí, as above, all paratypes), 55603–10 (Cerro Pejochaina, Zulia, summit and east slope, 09°57′N, 72°58′W, 2,000–2,300 m, all paratypes), 58118 (Pie Cerro, Zulia, 10°00′N, 72°50′W, 2,350 m), 58119–20 (Campamento Avispa, Zulia, 10°10′N, 72°48′W, 2,175 m), 73026–37 ('Camp Frontera 2', Zulia, 3,000 m, coordinates unknown). COLOMBIA: ICN 36239 (Sabana Rubia, Manaure, Balcón de Cesar, 10°22′N, 72°55′W); 35859, 36042 (Casa de Hierro, Sabana Rubia, La Paz, Cesar, 10°22′N, 72°54′W, 3,400 m); 36727, 36781 (Fig. 2vi) (above El Cinco, La Paz, Cesar, 10°22′N 72°57′W, 2,450 m); 36828, 36830–01, 36835–-37, 36846 (Casa de Vidrio, Sabana Rubia, La Paz, Cesar, 10°22′N, 72°54′W, 3,025 m). *Biomap*: FVZ 11852–53 (San Alberto, Cesar, 07°45′N, 73°23′W, but presumably higher than this locality or incorrectly labelled); USNM 375136–44, 375146–52 ('Serranía de Perijá', Cesar / La Guajira)

A.l. melanops CORDILLERA DE MÉRIDA, VENEZUELA: AMNH specimens inspected but no details taken; BMNH 85.6.7.28, 1915.3.1.139–46, 1969.52.90 ('Mérida'), 1969.39.83–84 (Culata, Mérida, 08°45′N, 71°05′W); COP 4737 (Vallecito, Mérida, 08°39′N, 71°06′W, 2,000 m), 5112–16 (Páramo Misisí, Trujillo, 09°20′N, 70°20′W, 2,100 m), 9468–72 (Páramo Zumbador, Táchira, 08°00′N, 72°05′W, 2,500–2,600 m), 14283–91 (Llano Rucio, Mérida, 09°00′N, 71°05′W, 2,500 m), 14595–97 (El Escorial, Mérida, 08°38′N, 71°05′W, 2,800 m), 14699 (Páramo San Antonio, Mérida, 08°40′N, 71°03′W, 3,000 m), 20084–89, 20092–98 (Páramo Cendé, Trujillo, 09°28′N, 70°05′W, 2,700–2,900 m), 20090–91 (Páramo Jabón, Trujillo, 3,000 m, apparently near Páramo Misisí, above, but coordinates unknown), 20279 (El Rincón, Cerro Niquitaz, Trujillo, 09°07′N, 70°30′W, 2,600 m), 24573–77, 24671–72 (Boca de Monte, Pragonero, Táchira, 08°01′N, 71°46′W, 2,300–2,400 m), 45464–79 (El Muerto, north slope, Páramo Aricagua, Mérida, 08°20′N, 71°11′W, 2,900–3,000 m), 49438–48 (La Honda, Santo Domingo, Mérida, 2,700 m, coordinates unknown), 64402–09 (Páramo La Negra, Mérida, 08°15′N, 71°40′W, 3,000–3,200 m), 71587 (Los Arangures, 35 km south of Mucuchíes, Mérida, 2,890 m, coordinates unknown); MNHN 3193–95, one unnumbered ('Mérida').

A.l. tamae EASTERN CORDILLERA, VENEZUELA: AMNH 11244 (Páramo Tamá camp, 07°25′N, 72°26′W, 3,000 m); COP 11241–48 (Páramo Tamá camp, as above, 2,000–3,000 m, all paratypes), 61517–21, 62505–15 (Hacienda La Providencia, río Chiquito, Táchira, 07°38′N, 72°12′W, 1,800–2,300 m), 74095–106 (Cumbre Cerro Retiro, Rebancha, Táchira, coordinates unknown, 2,800 m). COLOMBIA: AMNH 513795 ('Colombia'); CM 60221 (Boca del Monte, Boyacá, possibly *c.*05°36′N, 72°27′W but not included in analysis, photograph); FMNH 261868–70 (Hacienda la Primavera, Cubará, Boyacá, 07°00′N, 72°20′W) (photograph); ICN 18191 (Fig. 2v), 18192 (Toledo, Páramo de Tamá, Norte de Santander, 07°19′N, 72°28′W); MLS 5794, 6760–64 (Fontibón, Pamplona, Norte de Santander, 07°21′N, 72°39′W); USNM 410162 (Pamplona, Norte de Santander, 07°23′N, 72°39′W) (photograph).

A.l. olivaceiceps WESTERN CORDILLERA, COLOMBIA: AMNH 134366–70, 134374–76, (Paramillo, Antioquia, 07°03′N, 75°55′W); BMNH 1921.12.29.48 (Paramillo, as above); ICN 35001 (Fig. 2iii) (Vereda Monserrate, Jardín, Antioquia, 05°37′N, 75°53′W). *Biomap*: USNM 256357, 436971–75, 436977–78, 436980 (Paramillo, as above), 436966 (Hacienda La Ilusión, Urrao, Antioquia, 06°25′N, 76°05′W). CENTRAL CORDILLERA, COLOMBIA: AMNH 40703 ('Bogotá'); 148083 (Sabanalarga, Antioquia, 06°51′N 75°48′W), 513792 (Santa Elena, Antioquia, 06°15′N, 75°35′W), 513793–94 (both 'Medellín'); ANSP 7375 ('Bogotá', photograph); BMNH 85.6.12.417 ('Bogotá'), 1885.6.7.23–25, 1885.6.12.419 (Santa Elena, as above); ICN 34345, 34465 (El Escobero, San Sebastián, Envigado, Antioquia, 06°10′N, 75°35′W); ZMB 15879 ('New Granada', photograph); MLS 4826 (San Pedro, Antioquia, 06°28′N, 75°33′W), 4827 (Yarumal, Marconi, Antioquia, 06°58′N, 75°24′W), 8193 (El Chaquiro, Santa Rosa, Antioquia, 06°45′N, 75°32′W); MNHN al01, CG1999.3198 ('Antioquia'). *Biomap*: MCSJ 144 (San Pedro, as above), 284 (Boquerón, Antioquia, 06°17′N, 75°37′W), 480A, 481A, 482 (Santa Elena, as above), 2805 (Páramo de Sonsón, Antioquia, 05°43′N, 75°15′W), 2928–29, 2931 (Belmira, Páramo Santa Inés, Antioquia, 06°48′N, 75°43′W); MHNNL 92.8759, 92.8760A, 92.8760B ('Medellín'); USNM 427569–77, 428069, 536578 (Santa Rosa de Osos, Antioquia, 06°39′N, 75°28′W), 428068 ('Antioquia'), 436967–70 (Sonsón, Antioquia, 05°42′N, 75°18′W).

A.l. palpebrosus COLOMBIA: AMNH 40703 ('Bogotá'); 117339–42 (Almaguer, Cauca, 01°55′N, 76°50′W), 112988 (río Toche, Ibagué, Tolima, 04°32′N, 75°25′W), 112989 (Páramo de Santa Isabel, Risaralda / Tolima / Caldas border, 04°47′N, 75°26′W); 112991, 112993–3002 (Laguneta, Quindío, 04°34′N, 75°30′W); BMNH 1885.6.12.418 ('New Grenada'); CZUT 497, 505 (La Cascada, Anzoátegui, Tolima); ICN 2810 (San Marcos, Cauca, 02°20′N, 76°05′W), 2811–12 (Paletará, Cauca, 02°10′N, 76°26′W), 2813 (Termales, Tolima / Caldas, 04°58′N, 75°23′W), 2814 (Palermo, San Juan, Huila, 02°53′N, 75°28′W), 2815–16 (Fig. 2i) (La Cocha, Pasto, Nariño, 01°05′N, 77°09′W), 8502, 8531 (Chorreado, Puerres, Nariño, 00°50′N, 77°25′W), 26145, 26150, 26152–53, 26157 (Parque Nacional Natural (PNN) Nevado del Huila, Páez, Cauca, 03°01′N, 76°00′W), 29230, 29263, 29268, 29277–78 (La Victoria, Tumaco / Ipiales, Nariño, 00°35′N, 77°10′W), 29339 (Llorente, Nariño, 00°49′N, 77°15′W), 20445 (Herbeo, Tolima, 05°05′N, 75°20′W); MHNUC 2440–41, 2445–46, 2449 (La Victoria, as above), 2442 (Paletará, as above), 2444 (Muluzua, Totoró, Cauca, 02°29′N, 76°18′W); MHNUV 4435–38 (Bosque del Oso, 1.5 hours from Hacienda Corinto, Villa María, Caldas, coordinates unknown); 4862–63 (Finca Bengala, 3 km north of Cocora at the end of the Salento–Cocora, Salento, Quindío, 04°38′N, 75°29′W), 4563–64 (Bosque del Alto del Dulce, El Provenir / Bernal, road to Villamaría, Santa Rosa de Cabal, Risaralda, 04°52′N, 75°38′W), 4861, 5880–81 (km 33, Carretera Paletará–San José de Isnos, 1 km east of Quebrada Bujías, Huila, 02°00′N, 76°17′W); USNM 81823–24 ('Colombia', photographs). *Biomap*: ANSP 7374 (Pasto, Nariño, 01°13′N, 77°17′W), 162197, 162201–02, 162204 (Chorreado or Puerres, as above), 162198–99 (Derrumbe, Nariño, presumably at higher elevation than this locality, coordinates unknown), 162205–07, 162209–10 (Páramo de Guamués, as above), 154485–90, 154492–94, 154496 (Laguneta, as above); CM 26100, 70261–62, 70346, 70412, 70426 (Zancudo, Manizales, Caldas, 05°05′N, 75°30′W); CMUC 226 (Parque Regional Ucumarí, Risaralda, 04°39′N, 75°36′W), 341AE (Páramo de Letras, Caldas, 05°10′N, 75°20′W); FMNH 226920–21 (Moscopán, Cauca, 02°20′N, 76°05′W), 251435 (El Crucero, Puracé, Cauca, 02°20′N, 76°39′W), 255809 (San Rafael, Puracé, Cauca, 02°25′N, 76°25′W), 288119–22, 288139–40, 288152, 399532–33, 399539–44 (La Victoria, as above); ZSM 1965.391–93, 1965.522, 1965.525 (Totoró, as above), 1965.523–24 (Santa Leticia, La Plata, Huila, 02°14′N, 76°10′W); INCIVA 2502 (Reserva Natural (RN) La Planada, Ricaurte / Barbacoas, Nariño, 01°15′N, 78°15′W), 2508, 2510 (Totoró, as above), 2509 (10 km north of Pasto, Nariño, 01°14′N, 77°17′W), 2511 (Coconuco, PNN Puracé, Cuaca, 02°24′N, 76°27′W); LSU 38935–36 (Totoró, as above), 48194, 61902 (El Crucero, as above); MHNG 1179.076–078, 1179.080–081 (La Victoria, as above); MVZ 120670 (3 km east of Andalucia, Huila, 01°54′N, 75°41′W), 140719 (Cordillera de Portachuelo, Putumayo, 01°07′N, 76°52′W), 223291 (río Toche, as above); UMMZ 223290 (Páramo de Guamués, Nariño, 00°50′N, 77°20′W), 223292 (Laguneta, as above); LACM 39723, 39735 (Conocuno, as above), 33247–50, (Totoró, as above), 33251–52 (La Plata, as above); USNM 447616–21 (Puracé, Cauca, presumably as above); YPM 32195 (Totoró, as above). ECUADOR: AMNH specimens inspected but no details taken; BMNH 1847.1.16.15 (no locality data), 1860.11.26.24 ('Quito'), 1885.6.7.26–27 (Villagómez, San Lucas), 1925.12.24.244, 1925.12.24.278 (Huila), 1938.12.20.121 (Papallacta), 1940.12.5.183–184 (Cuyuja, Napo / Pastaza), 1969.52.88–89 (below Papallacta). Specimens labelled *A.l. caerulescens* ECUADOR: AMNH specimens inspected but no details taken; BMNH 1953.68.412 (Huaico, Loja). PERU: AMNH specimens inspected but no details taken; BMNH 1885.6.8.435 (Cutervo).

A.l. intensus WESTERN CORDILLERA, COLOMBIA: AMNH 110213–24, 110227–30 ('Coastal range', Cauca, coordinates unknown but presumably near Munchique), 461665 (Cerro Munchique, Cauca, see below); ICN 25790 (Fig. 2ii), 25818 (Farallones del Cauca, Valle del Cauca, 03°22′N, 76°45′W), 25864, 30107 (Chargüayaco, Cerro Munchique, El Tambo, Cauca, 02°40′N, 76°57′W); MHNUC 2443 (Chargüayaco, as above), 3375–77 (La Romelia, PNN Munchique, El Tambo, Cauca, 02°27′N, 76°49′W); MHNUV 1048 (rio Cali, Calle, 2,000–2,300 m, 03°30′N, 76°30′W) 3926, 3929, 3940, 3995, 4005, 4006 (Alto del Buey, Farallones de Cali, as above) 4563–64 (Bosque de Alto del Dulce–El Porvenir, Santa Rosa de Cabral, Risaralda); MLS 6765–66 (El Tambo, as above). *Biomap*: ANSP 141900, 141902–03, 144630 (Munchique, as above), 141905, 150225 (Gamboa, San Antonio, Cauca, 02°37′N, 76°54′W); FMNH 53776–77, 307939 (west of Popayán, Cauca, no details), 226916–17, 249986–89 (Munchique, as above); LSU 38934 (Munchique, as above); MHNG 1140.017–22, 1167.045, 1216.028 (Munchique, as above); LACM 29247–57, 37576 (Munchique, as above); USNM 459541–46 (El Tambo, as above); YPM 32196–97 (Munchique, as above).

A.l. lacrymosus PERU: AMNH: all specimens inspected and seven measured but no details taken; BMNH 1896.10.6.168, 1896.10.6.169 (latter, two specimens, same no.) (Chachapoyas, 2,743 m), 1885.6.12.421 (Higos); MNHN 3196, GC1901in1676 (Cumpary, 2,400 m).

Photographs

A.l. melanops CORDILLERA DE MÉRIDA, VENEZUELA: PNN Dinira, Lara, 09°34′N, 70°06′W (J. E. Miranda T.: Fig. 1vi).

A.l. yariguierum SERRANÍA DE LOS YARIGUÍES, COLOMBIA: Lepipuerto (details in text) (Donegan *et al.* 2007).

A.l. olivaceiceps WESTERN CORDILLERA, COLOMBIA: Reserva Natural de Aves (RNA) Colibrí de Sol, Urrao, Antioquia, 06°26′N, 76°05′W, 3,400 m (Krabbe *et al.* 2006; A. Quevedo / ProAves: Fig. 1(iv)).

CENTRAL CORDILLERA, COLOMBIA: La Lana, San Pedro de los Milagros, Antioquia, 06°27′N, 75°36′W, 2,645 m (T. M. Donegan / J. E. Avendaño / B. Huertas: Fig. 1iii).

A.l. palpebrosus COLOMBIA: Reservas de Aves Comunitarias, Roncesvalles, Tolima, 04°00′N, 75°40′W (A. Quevedo / ProAves: Fig. 1v); RNA Loro Coroniazul y El Mirador, Génova, Quindío, 04°08′N, 75°44′W, 3,200 m (A. Quevedo / ProAves).

A.l. intensus WESTERN CORDILLERA, COLOMBIA: RNA Mirabilis-Swarovski, Cauca, 02°31′N, 76°59′W, 2,400 m (J. P. López Ordoñez / ProAves: Fig. 1vii).

Sound-recordings

A. melanogenys SANTA MARTA, COLOMBIA: RN El Dorado, San Lorenzo, Magdalena, 11°06–09′N, 74°03–06′W, 1,450–2,700 m (Krabbe 2008a: Fig. 6F; C. Hesse recording: XC 10194; T. M. Donegan recording: XC 37290).

A.l. pallididorsalis SERRANÍA DE PERIJÁ, COLOMBIA: above El Cinco, vereda El Cinco, Manaure, Cesar, 10°21′N 72°56′W, 2,450 m (J. E. Avendaño: Fig. 6D).

A.l. melanops CORDILLERA DE MÉRIDA, VENEZUELA: Parque Nacional (PN) Guaracamal, Trujillo, 09°10′N, 70°11′W (Boesman 1999: Fig. 6C).

A.l. yariguierum SERRANÍA DE LOS YARIGUÍES, COLOMBIA: Lepipuerto (details in text).

A.l. olivaceiceps CENTRAL CORDILLERA, COLOMBIA: Bello, San Félix, Serranía Las Baldías, Antioquia, 06°01′N, 75°35′W (Álvarez *et al.* 2007: Fig. 5F).

A.l. palpebrosus COLOMBIA: San Juan de Pasto, Daza, Nariño, 01°16′N, 76°15′W, 2,800 m (O. Laverde: XC 12748–49: Figs. 5G, 5H); río Blanco, Caldas, 05°05′N, 75°21′W (Álvarez *et al.* 2007: Fig. 6E); Neira, vereda la Cristalina, headwaters of the río Tapias, Caldas, supposedly 05°34′N 74°53′W but probably further west and at higher elevation (Álvarez & Córdoba 2002, Álvarez *et al.* 2007: Fig. 5C). ECUADOR: Cordillera de Güacamayos, Napo, 00°37′S, 77°50′W, 2,300 m (Krabbe *et al.* 2001; Krabbe & Nilsson 2003); Cabañas San Isidro, Napo (00°35′S, 77°53′W, 2,100 m) (Moore & Lysinger 1997); Guango Lodge, Napo, 00°23′S, 78°36′W, 2,800 m (S. Olmstead: XC: 177719); 1 km below Oyacachi, Napo, 00°13′S, 78°04′W, 3,150 m (Krabbe & Nilsson 2003); El Chorillo, Santa Barbara–La Bonita Road, Sucumbíos, 00°36′N, 77°31′W, 2,650 m (Krabbe & Nilsson 2003).

A.l. caerulescens ECUADOR: Reserva Tapichalaca, Zamora-Chinchipe, 04°29′S, 79°09′W and 04°30′N, 79°08′W, 2,500–2,830 m (Krabbe & Nilsson 2003: Fig. 5D; A. Spencer: XC 17470); Cerro Toledo, east slope, Zamora-Chinchipe, 04°23′S 79°06′W, 3,150 m (Krabbe *et al.* 2001; Krabbe & Nilsson 2003); PN Podocarpus, Cajanuma, Loja, 04°06′S 79°09′W and 04°07′S, 79°10′W, 2,750–2,800 m, (Krabbe *et al.* 2001: Fig. 5G; C. Vogt: XC 16408); Gualaceo–Limón road, Morona-Santiago, 03°02′S, 78°35′W (Krabbe *et al.* 2001).

A.l. lacrymosus PERU: Bosque Unchog, Huánuco, 09°41′S, 76°07′W, 3,250 m (C. Hesse: XC 10778, 10779).

Mist-net data

A. melanogenys SANTA MARTA, COLOMBIA: RNA El Dorado (details above) (E. Rodríguez, D. Velasco, C. Olaciregui *et al.* / ProAves).

A.l. yariguierum SERRANÍA DE LOS YARIGUÍES, COLOMBIA: The following individuals were photographed and ringed with ProAves rings, but are not assigned as types: Lepipuerto captures (2): ProAves ring nos. C02480 and C02481, each captured on 9 January 2005 at 07.00 h; Filo Pamplona captures (ten in addition to the recaptured paratype, all with blood samples taken and deposited at UniAndes): C02767 captured on 11 July 2005 at 17.00 h (recaptured on 13 July 2005 at 07.30 h); C02769 captured on 12 July 2005 at 07.00 h; C02770–73 and C02775, all captured on 12 July 2005 at 16.30–17.30 h; C02779 captured on 13 July 2005 at 06.30 h (recaptured on 14 July 2005 at 07.00 h); C02789 captured on 13 July 2005 at 18.30 h; C02791 captured on 14 July 2005 at 07.00 h. For localities, see text.

A.l. olivaceiceps WESTERN CORDILLERA, COLOMBIA: RNA Loro Orejiamarillo, Jardín, Antioquia, four localities: 05°32′N, 75°48′W, 2,700 m; 05°33′N, 75°48′W, 2,700 m; 05°36′N, 75°51′W, 1,600 m; 05°46′N, 75°58′W, 1,600 m (G. Suárez *et al.*: ProAves); Páramo Frontino, Antioquia, two localities: 06°26′N, 76°05′W, 3,500 m; 06°25′N, 76°04′W, 2,800 m (D. Carantón *et al.*: ProAves).

A.l. palpebrosus COLOMBIA: Reservas Comunitarias de Roncesvalles, Tolima, 04°00′N, 75°40′W, 1,500–3,500 m (D. Vesasco *et al.*: ProAves); RNA Loro Coroniazul y El Mirador, Mirador, Génova, Quindío, details above (D. Ramirez, F. Guzman *et al.*: ProAves); vereda El Páramo, Marulanda, Caldas, 05°17′N, 75°16′W, 2,800 m (A Quevedo: ProAves); RN Ibanasca, Tolima, 04°38′N, 75°19′W, 2,900–3,600 m (D. Bejarno / A. González: ProAves); vereda Las Sabinas, Manizales, Caldas (coordinates unknown) (A. Quevedo: ProAves).

Observations

Note: localities mentioned in previous sections are not repeated here.

A. melanogenys SANTA MARTA, COLOMBIA: río Frío, Ciénaga, Magdalena, 10°54′N, 73°53′W, 1,500–2,900 m (Strewe & Navarro 2004).

A.l. pallididorsalis SERRANÍA DE PERIJÁ, COLOMBIA: Cerro Pintado, Cesar, 10°28′N, 72°55′W, 1,500–3,200 m (P. Salaman: ProAves; IAVH).

A.l. yariguierum SERRANÍA DE LOS YARIGUÍES, COLOMBIA: Cerro Las Tetas, Camino del Lenguerke, San Vicente de Chucurí, Santander, 06°51′N, 73°21′W (J. C. Luna: ProAves).

A.l. tamae EASTERN CORDILLERA, COLOMBIA: Quetame, Cundinamarca, 04°18′N, 73°52′W (P. Salaman: ProAves); El Alto del Tigre, El Calvario, Meta, 04°22′N, 73°40′W (F. G. Stiles); Loma La Aurora, Bogotá, Cundinamarca, 04°47′N, 74°01′W (P. Salaman: ProAves); Santuario de Fauna y Flora Igüaque, Boyacá, 05°40′N, 73°27′W (J. Zuluaga); Páramo de Monsalve, Santander (07°24′N, 72°56′W, 2950 m) (Avendaño 2006).

A.l. olivaceiceps WESTERN CORDILLERA, COLOMBIA: PNN Tatamá, Pueblo Rico, Risaralda, 05°09′N, 76°02′W (DATAVES). CENTRAL CORDILLERA, COLOMBIA: Páramos del Sur de Antioquia, Antioquia, 05°38′N, 75°12′W, 800–3,200 m (IAVH); Carretera Caldas–Agelópolis, Angelópolis, Antioquia, 06°05′N, 75°39′W, 1,800–2,600 m (P. Restrepo: DATAVES); quebrada El Viao, Cocorná, Antioquia, 06°01′N, 75°27′W, 1,880–1,950 m (DATAVES); Retiro, Antioquia, 06°04′N, 75°30′W, 1,600 m (various observers: DATAVES); Alto del Escobero / San Sebastián, Retiro, Antioquia, 06°03′N, 75°′35′W (many observers: DATAVES); Corregimiento San Cristóbal, Medellín, Antioquia, 06°04′N, 75°30′W (M. J. Peña: DATAVES); Cuenca Quebrada, Santa Elena, Medellín, Antioquia, coordinates as above (G. J. Castaño: DATAVES); Área de Reserva Forestal Protectora, La Romera, Sabaneta, Antioquia, 06°07′N, 75°36′W (P. Pulgarín: DATAVES); Envigado, Antioquia, 06°09′N, 75°36′W (R. Vélez de Bedout: DATAVES); La Estrella, Antioquia, 06°09′N, 75°39′W (A. M. Castaño: DATAVES); Las Antenas, San Félix, Medellín, Antioquia, 06°20′N 75°39′W (many observers: DATAVES); Páramo de Belmira, Belmira, Antioquia, 06°30′N, 75°45′W (T. Cuadros: DATAVES).

A.l. palpebrosus COLOMBIA: Ipiales, Nariño, 00°50′N, 77°37′W (P. Salaman: ProAves); laguna de la Cocha, Pasto, Nariño, 01°07′N, 77°16′W (F. G. Stiles: DATAVES; IAVH); Reserva la Rejoya, Colón, Putumayo, 01°08′N, 76°56′W, 2,660 m (DATAVES); Pasto–Mocoa road, Nariño, coordinates not known (P. Salaman: ProAves); Coconuco; Daza, Pasto, Nariño 2,800 m, 01°17′N, 77°15′W (C. Downing); Serranía de las Minas, Huila, 02°10′N, 76°11′W, 2,100–2,700 m (IAVH); Reserva Natural Privada Meremberg, La Plata, Huila, 02°23′N, 76°23′W, 2,200–2,400 m (P. Salaman: ProAves; P. Flórez: DATAVES); PNN Puracé, Cauca, 02°22′N, 76°30′W, 2,600–2,800 m (P. Flórez & F. Piedrahita: DATAVES); Pilimbala–San Nicolás road, PNN Puracé, Cauca, coordinates unknown (P. Salaman: ProAves); cuenca del río Hereje, Tolima, 03°18′N, 76°00′W, 3,280–3,760 m (IAVH); Coconuco–San Agustín road, PNN Puracé, Cauca, coordinates unknown (P. Salaman: ProAves); Reserva Natural Semillas de Agua, Tolima, 04°14′N, 75°33′W, 3,100–3,800 m (IAVH); Reserva Natural Privada Semillas de Agua, Cajamarca, Tolima, 04°27′N, 75°26′W (Querubin Rodriguez Pinilla: DATAVES); cañón del río Combeima, Tolima, 04°32′N, 75°18′W, 1,700–2,800 m (IAVH); cuenca del río Toche, Tolima, 04°36′N, 75°24′W, 1,500–3,500 m (IAVH); valle del Cocora, Salento, Quindío, 04°37′N, 75°27′W (J. C. Saenz & J. Ramírez: DATAVES); Acaime, RN Alto Quindío, Salento, Quindío, 04°37′N, 75°28′W, 2,500–3,500 m (various observers: DATAVES / ProAves); Serranía de los Paragüas, Quindío, 300–2,700 m (IAVH); Estación Altamira, Reserva Natural Privada Narvaco, Salento, Quindío, 04°38′N, 75°29′W (F. G. Stiles: DATAVES); PNN Ucumarí, Pereira, Risaralda, 04°38′N, 75°35′W (many observers: DATAVES); La Montaña, Reserva Natural Narcavo, Salento, Quindío, 04°38′N, 75°28′W, 2,700 m (D. Duque Montoya / F. G. Stiles: DATAVES); lagunas Bombona and Vancouver, Tolima, 04°39′N, 75°13′W, 3,010–4,000 m (IAVH); La Pastora, Ucumarí, Risaralda, 2,600–2,800 m, 04°42′N, 75°30′W (C. Downing); Finca Paragüay, Santa Isabel, Tolima, 04°45′N, 75°17′W, 3,280–3,760 m (IAVH); Bosques del Oriente de Risaralda, Risaralda, 04°47′N, 75°32′W, 1,800–3,800 m (IAVH); Termales del Ruiz, Villamaría, Caldas, 04°58′N, 75°23′W, 2,800–3,000 m (L. Arango: DATAVES); río Blanco, Manizales, Caldas, 05°04′N, 75°32′W, 2,500 m (many observers: DATAVES, ProAves, IAVH); Marulanda, Caldas, 05°17′N, 75°16′W (L. Rosselli: DATAVES); Pácora, Caldas, 05°32′N, 75°26′W (D. Piedrahita Thiriez: DATAVES). ECUADOR: Additional localities for this and *A.l. caerulescens* listed in Zimmer (1944) and Ridgely & Greenfield (2001).

A.l. intensus WESTERN CORDILLERA, COLOMBIA: El Tigrillo, Munchique, Cauca (J. Sandoval: ProAves); Reserva Natural Tambito, 20 de Julio, Cauca, 02°31′N, 76°59′W, 2,300 m (J. Sandoval: ProAves); Bosque de San Antonio, km 18, east slope of West Andes, Cali, Valle del Cauca, 03°30′N, 76°38′W (C. M. Wagner).

APPENDIX 2: Biometrics of *Anisognathus* taxa

The data below are taken from specimens, or live individuals, by the authors, or other researchers, using the same methodology. For all taxa, data are presented in the form mean ± standard deviation (*n* = sample number), with all measurements in mm, except mass (g). / = no data available.

Taxon	**Wing-chord (mm)**	**Tail (mm)**	**Tarsus (mm)**	**Bill (to skull) (mm)**	**Mass (g)**
A. melanogenys (Santa Marta, Colombia) specimens	88.2 ± 3.4 (81.0–94.0) (*n*=12)	73.8 ± 2.8 (69.0–78.0) (*n*=12)	27.4 ± 1.0 (26.0–29.0) (*n*=12)	18.5 ± 0.5 (18.0–19.5) (*n*=11)	/
A. melanogenys (Santa Marta, Colombia) live birds	87.5 ± 2.9 (84.0–97.0) (n=20)	/	/	/	40.5 ± 3.0 (33.8–44.7) (*n*=19)
A. lacrymosus pallididorsalis (Perijá, Colombia / Venezuela) specimens	89.3 ± 3.5 (85.0–93.0) (*n*=4)	70.3 ± 3.4 (67.0–75.0) (*n*=4)	24.3 ± 0.5 (24.0–25.0) (*n*=4)	14.3 ± 0.5 (14.0–15.0) (*n*=4)	32.0 (*n*=1)
A.l. melanops (Mérida, Venezuela) specimens	87.9 ± 2.8 (84.0–92.0) (*n*=16)	70.6 ± 2.7 (66.0–75.0) (*n*=15)	25.7 ± 0.9 (24.5–28.0) (*n*=15)	15.9 ± 0.5 (15.0–16.5) (*n*=16)	/
A.l. yariguierum (Yariguíes, Colombia) live birds	93.7 ± 4.8 (86.0–101.0) (*n*=13)	74.2 ± 2.8 (70.0–80.0) (*n*=13)	26.1 ± 1.1 (24.0–28.3) (*n*=13)	16.1 ± 1.0 (14.1–17.0) (*n*=12)	35.9 ± 1.9 (32.5–40.3) (*n*=13)
A.l. yariguierum (Yariguíes, Colombia) specimens	92.6 ± 4.5 (86.3–99.0) (*n*=6)	78.3 ± 2.8 (74.1–81.4) (*n*=6)	26.0 ± 0.4 (24.1–26.5) (*n*=6)	16.7 ± 0.5 (14.5–17.4) (*n*=6)	35.8 ±2.4 (32.0–38.0) (*n*=6)
A.l. tamae (East Andes, Colombia / Venezuela) specimens	88.1 ± 4.2 (82.0–94.0) (*n*=10)	70.7 ± 3.9 (63.0–78.0) (*n*=10)	25.2 ± 1.0 (23.5–26.0) (*n*=7)	15.3 ± 0.6 (14.5–16.5) (*n*=10)	/
A.l. olivaceiceps (Central Andes, Colombia) live birds	90.9 ± 3.3 (79.0–98.0) (*n*=199)	78.9 ± 2.6 (73.0–84.1) (*n*=146)	26.6 ± 0.9 (23.5–30.6) (*n*=149)	18.3 ± 1.5 (14.0–21.5) (*n*=147)	37.4 ± 3.4 (22.4–47.5) (*n*=209)
A.l. olivaceiceps (Central Andes, Colombia) specimens	90.8 ± 2.7 (86.0–97.5) (*n*=25)	74.3 ± 3.2 (69.0–80.0) (*n*=25)	25.7 ± 0.8 (24.0–27.5) (*n*=25)	16.3 ± 0.9 (14.0–18.1) (*n*=23)	32.5 ± 3.4 (29.0–37.0) (*n*=4)
A.l. palpebrosus (S. Colombia and N. Ecuador) live birds	92.1 ± 3.0 (79.8–98.0) (*n*=59)	81.6 ± 3.3 (71.5–89.9) (*n*=54)	27.6 ± 1.8 (24.3–30.4) (*n*=55)	15.2 ± 1.2 (12.7–17.5) (*n*=54)	35.3 ± 2.2 (30.6–40.0) (*n*=57)
A.l. palpebrosus (S. Colombia and N. Ecuador) specimens	89.0 ± 3.8 (79.0–99.0) (*n*=68)	75.0 ± 3.4 (67.0–84.3) (*n*=67)	25.4 ± 1.1 (23.0–30.0) (*n*=66)	16.1 ± 0.9 (13.0–18.0) (*n*=67)	33.0 ± 2.2 (30.5–38.0) (*n*=10)
A.l. caerulescens (S. Ecuador and N. Peru) specimens	87.5 ± 3.1 (85.0–95.0) (*n*=13)	70.3 ± 3.5 (64.0–74.0) (*n*=12)	24.8 ± 1.6 (22.0–27.5) (*n*=12)	16.1 ± 0.9 (14.5–17.2) (*n*=12)	/
A.l. intensus (West Andes, Colombia) specimens	91.7 ± 4.0 (82.0–100.0) (*n*=36)	74.1 ± 3.7 (67.0–81.3) (*n*=36)	25.5 ± 1.3 (22.2–27.6) (*n*=35)	16.3 ± 0.8 (15.1–18.1) (*n*=34)	37.0 (*n*=1)
A.l. lacrymosus (Peru) specimens	85.6 ± 3.7 (77.0–92.0) (*n*=13)	69.5 ± 2.8 (64.5–76.0) (*n*=13)	24.8 ± 1.0 (23.5–26.5) (*n*=13)	15.5 ± 0.6 (14.5–16.5) (*n*=13)	/

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New biogeographic records for the avifauna of Taliabu (Sula Islands, Indonesia), with preliminary documentation of two previously undiscovered taxa

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SUMMARY.—The Sula archipelago lies between Sulawesi and the northern Moluccas in Wallacea. The avifauna of the archipelago, including Taliabu, its largest and most diverse island, is under-explored, and current understanding is based on just one major historic collecting effort and several visits by modern ornithologists. There is limited knowledge especially of the highland birds of Taliabu, since only one ornithological expedition has reached this area, discovering in the process *c.*7 previously unrecorded species potentially meritorious of subspecific recognition. I describe the results of a two-week survey of Taliabu, encompassing both lowland and highland areas. An update is given on the state of the habitat on Taliabu, which has undergone major forest conversion and degradation due to logging, agricultural practices and forest fires. I present new elevational information for at least 14 bird species, and records of four species previously unrecorded on the island. Two of these represent undescribed taxa, one of them probably a new species. Comments on the taxonomy of several Taliabu birds are made on the basis of fresh vocal or morphological data, indicating that many endemic Sula races merit upgrading to species status. Given rapid forest loss on Taliabu, judicious collecting and genetic and vocal work on the taxonomy of its birds are urgently required.

The Sula Islands form a small and isolated Indonesian archipelago between Sulawesi and the Banggai Islands to the west and the Moluccan islands of Halmahera, Obi and Buru to the east. The Sula group comprises three major islands (Taliabu, Mangole and Sanana) and a wealth of smaller islets covering 9,632 km^2 (Fig. 1). At 2,913 km^2, Taliabu is the largest island in the archipelago (Fig. 1), but is also much more remote than the other two main islands, still lacking an airport as of 2009, and less densely populated than Sanana. Ecologically, Taliabu is also the most diverse of the archipelago, with mountains rising above at least 1,325 m (see Methods for further discussion), and the presence of a montane forest zone above 800 m. In contrast, Mangole rises barely above 800 m, and Sanana's highest elevation is *c.*450 m (GoogleEarth satellite imagery).

Whilst the Sula Islands are politically part of the Moluccan province of Maluku Utara (=North Maluku), biogeographically they constitute a transition zone between the Moluccas and Sulawesi. Moluccan influence notwithstanding, the Sula Islands' avian community is considered to be dominated

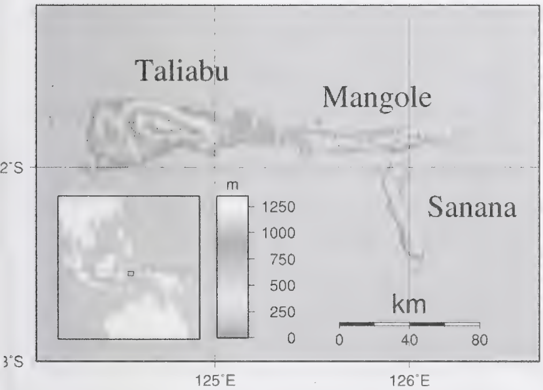


Figure 1. Map of the Sula Islands, showing the three main islands of Taliabu, Mangole and Sanana (=Sula Besi). Small inset (lower left) indicates the position of the Sula Islands within the Indonesian archipelago.

by Sulawesi elements. Hence, most ornithologists have assigned the Sula Islands to the zoogeographic region of Sulawesi, albeit at the status of a subregion (e.g. White & Bruce 1986, Coates & Bishop 1997). Despite the avifaunal link to Sulawesi in the west and the Moluccas in the east, the Sula avifauna is characterised by a sizeable endemic or near-endemic element (White & Bruce 1986), much of which is shared with the Banggai Islands to the west (ICBP 1992, Sujatnika *et al.* 1996, Stattersfield *et al.* 1998). In its initial assessment using the distributional and taxonomic knowledge of the day, ICBP (1992) listed nine range-restricted bird species exclusive to the Sula and Banggai groups. Consequently, the two archipelagos are treated as an Endemic Bird Area (ICBP 1992, Sujatnika *et al.* 1996, Stattersfield *et al.* 1998).

The faunal connection between Sula and Banggai has long puzzled zoologists, because the geographic position of the Banggai group, just 14 km off Sulawesi, seemingly contradicts the obvious faunal ties with the Sula Islands, more than 80 km distant. However, modern geologic, palaeoclimatic and bathymetric data go a long way to explain this unusual biogeographic link. Hall (2002) showed that the two groups form a tectonic unit that has been drifting west towards Sulawesi and has closely approached it only within the last four million years. In addition to their common geologic origin, the Sula and Banggai islands have also repeatedly been connected during *c.*20 glacial epochs within the last three million years, each lasting *c.*10,000–50,000 years. These connections arose when glacial periods caused global sea levels to fall by up to 130 m (Lambeck & Chappell 2001, Siddall *et al.* 2003, Thompson & Goldstein 2005, Bintanja *et al.* 2005, Caputo 2007), exposing shallow areas, such as the string of tiny islets that connect the Sula and Banggai archipelagos. On the other hand, the narrow strait between Sulawesi and the Banggai Islands has never accommodated a landbridge, being characterised by a deep-sea trench of *c.*400–700 m (Becker *et al.* 2009).

Ornithologically, the Sula Islands in general, and Taliabu in particular, have been much less well explored than most other Indonesian archipelagos of comparable size. Unlike the extensive historic collecting that has occurred on Sulawesi and throughout most of the Moluccas, the Sula Islands were visited by just a few collectors in the late 19th and early 20th centuries (White & Bruce 1986), with the most recent such visit, in 1938, by J. J. Menden the only significant collecting effort to have been undertaken on Taliabu (White & Bruce 1986). During a visit to Sanana and Mangole in December 1988, D. Yong (pers. comm.) was the first ornithologist to confirm the continued existence of most endemics after the world wars. These two islands may not have received any subsequent ornithological attention, as all recent visitors confined their activities to the ecologically more diverse island of Taliabu. In 1991, P. J. Davidson *et al.* from the University of East Anglia (UEA), UK, undertook an extensive exploratory survey of Taliabu. They were probably the first ornithologists to visit the highlands above 600 m, where they made several important findings, including potential new taxa (Davidson *et al.* 1991, Davidson & Stones 1993, Davidson *et al.* 1995, Stones *et al.* 1997). For simplicity, I refer to their original report (Davidson *et al.* 1991) when citing the findings of the UEA expedition. Following this, the lowlands of Taliabu were visited in March 1997 by F. Verbelen (pers. comm.) and in 2005 by B. King (*in litt.* 2006), who confirmed many of Davidson *et al.*'s findings, but did not venture sufficiently high to re-encounter the latter's novel records from the Taliabu highlands.

Apart from their important work in assessing the abundance of the endemic and near-endemic birds on Taliabu, Davidson *et al.*'s (1991) most important contribution was the discovery of seven passerines previously unrecorded in the Sula Islands, all of which '. . . may possibly represent undescribed endemic subspecies . . .' (Davidson *et al.* 1991: 37). These included new populations of Red-and-black Thrush *Zoothera mendeni* (formerly considered a subspecies of Red-backed Thrush *Z. erythronota*), Mountain Tailorbird *Orthotomus cuculatus*, Island Leaf Warbler *Phylloscopus poliocephalus*, Mountain White-eye *Zosterops montanus*, Snowy-browed Flycatcher *Ficedula hyperythra*, Island Verditer Flycatcher *Eumyias panayensis* and Sulawesi Myzomela *Myzomela chloroptera* (formerly considered a subspecies of Scarlet Myzomela *M. sanguinolenta*). These new biogeographic records suggest that Taliabu merits renewed attention from field ornithologists, that additional novelties might await the intrepid explorer, and that the taxonomy of many bird species on Taliabu, not only those discovered by Davidson *et al.* (1991), is in urgent need of re-examination. In the future, fresh collecting efforts will be prerequisite as a foundation for genetic and morphological work into the taxonomic status of the island's birds, and further field studies will be invaluable to collect vocal data that might inform taxonomic decisions.

The present contribution details the findings of a recent visit to Taliabu in April 2009, involving observations, photography and sound-recording of birds. No effort was made to collect birds, although the trip was undertaken with a view to facilitate future collecting efforts pending acquisition of a permit. I am currently involved in a dialogue with the Indonesian government agency, LIPI, with the aim of establishing a joint research project that will involve bird collecting. I frequented a wide range of habitats from sea level to montane forest. I reached the highlands in the interior of Taliabu at 1,100 m on three different occasions, surveying birds at probably the highest elevations ever on Taliabu. Survey work broadly aimed to determine species presence, but special efforts were made to document endemic taxa and those newly reported by Davidson *et al.* (1991) photographically or bio-acoustically. During the expedition, new elevational records were made for several species, whilst others were found on Taliabu for the first time. I also present new data on the taxonomy of most of Davidson *et al.*'s (1991) potential new endemic subspecies, and, most significantly, I provide preliminary documentation of two other new taxa that await description.

Study area and methods

On 4–18 April 2009, I was based in the village of Binadesa (01°43′S, 124°50′E) near Jorjoga (01°40′S, 124°48′E) on the central north coast of Taliabu. Birds were surveyed daily from morning until evening and—on several occasions—beyond dusk. Secondary forest from the coast to *c.*500 m was surveyed during day trips from Binadesa. On three occasions, I ventured into the central highlands of Taliabu along logging tracks to elevations up to 1,100 m; these trips each lasted 2–4 days. Photographs were taken using a Panasonic Lumix DMC-FZ18. Following the loss of better-quality equipment due to technical problems, sound-recordings were made using a Sony TCM-200DV cassette recorder with inbuilt microphone. Sonograms were prepared using Syrinx 2.6h by John Burt (available at www.syrinxpc.com). Elevations were measured using a barometric altimeter that was regularly calibrated at sea level. Note that montane camping excursions were conducted in highlands up to 1,100 m, from where surrounding elevations could be viewed. At the highest point reached, the peaks of the highest hilltops on the island were only slightly higher than my elevation, which is compatible with GoogleEarth satellite data that indicate a highest elevation of 1,325 m for Taliabu. In contrast, Davidson & Stones (1993), as well as older atlas sources, consistently refer to 1,649 m as the highest elevation on Taliabu. This older elevational reference is potentially flawed, since it agrees neither with satellite imagery nor with my own observations using a calibrated altimeter.

Recent state of habitat on Taliabu

Taliabu has undergone drastic habitat clearance in the last two decades. Primary lowland forest might be gone from the island, and logging companies have invaded the highlands up to 1,200 m along dozens of logging roads. The following assessment of habitat viability is based on my own observations. Although my field work was restricted to the central north of the island, extrapolations for the whole of Taliabu can be made by comparing field observations with satellite imagery from GoogleEarth.

The narrow (4-km-wide) central northern coastal plain in the vicinity of Menanga (01°42′S, 124°53′E) and Jorjoga held remnants of primary forest and extensive connecting secondary forest as recently as March 1997 (F. Verbelen pers. comm.). However, during the 1990s and the first years of the new millennium, Taliabu lost most of its lowland forest through logging by at least two different companies (P. Obrin pers. comm.). Villagers in Binadesa and Jorjoga reported that one of these two companies had logged the environs of their villages during two different periods each lasting 3–5 years. Several logging roads designed for heavy machinery were constructed into the interior highlands, subsequently facilitating easy access to villagers for opportunistic additional logging and agricultural habitat conversion after the companies' departure from Taliabu. I gained access into the highlands along two logging tracks, but satellite imagery indicates the presence of ten such tracks in the vicinity of Jorjoga and Menanga alone.

The coastal plain at Jorjoga and Menanga is now fully converted to coconut palm plantations and crop fields. Further inland, most areas below 600 m have been converted to orchards and gardens, although small patches of heavily degraded secondary forest persist in gullies. Above 600 m, there are few gardens and orchards, but forest along logging tracks is heavily degraded, as most of the taller trees in valleys have been removed and undergrowth has largely been cleared. Satellite imagery indicates that the ten logging tracks ascending south of Menanga and Jorjoga may have accounted for the degradation of >60% of montane forest habitat in these watersheds, and habitat degradation over the rest of the island is probably comparable, based on satellite images.

In addition, forest fires have caused large-scale destruction of montane forest above 750 m. According to villagers, a large fire in the 1980s (probably in 1982–83) was responsible for the loss of *c*.3,000 ha of montane forest (estimated from satellite imagery). The affected area covers *c*.70% of montane forest south of Jorjoga and Menanga, which is now characterised by grassy pasture with little bush growth and the presence of many tall old burnt snags. That little regrowth is observed in these areas >20 years after the incident indicates that some damage might have been permanent or is reinforced periodically through smaller fires. During my highland visits, only one small patch (*c*.100 ha) of dwarf montane forest above 1,000 m was found that had neither been affected by fires or logging, and this harboured a distinct avifauna undetected elsewhere on the island (see species accounts). Although more such habitat may persist elsewhere away from logging tracks, the threats posed by logging and fire mean that such habitat may be now very scarce and its specialised avian community therefore endangered.

Discouragingly, government prospectors were present during my stay, investigating the potential of the sub-montane and montane zone south of Jorjoga for conversion to plantation crops. Any future agricultural conversion would place further strain on the island's natural communities.

Species accounts

The following accounts relate new elevational, distributional, ecological or taxonomic information. Other species encountered but not mentioned below are listed in Table 1.

MEYER'S GOSHAWK *Accipiter meyerianus*
Single adults on 7, 9 and 12 April 2009, with a pair on 8 April 2009. Most sightings might involve the same two birds, generally at *c*.1,000 m, with a sighting at 700 m perhaps being an additional individual. Birds were heard briefly giving a courtship vocalisation (*ki ki ki ki ki*) but no sound-recording was obtained. Photographs of two birds were taken at 1,000 and 700 m, respectively (e.g. Fig. 2). All sightings were of birds perched on exposed branches in single tall trees within logged forest. My sightings of this unobtrusive raptor were probably made at a fortuitous season when a breeding pair was vocally and visually conspicuous. Their size, *Accipiter* shape and jizz, solid slate-grey upperparts and densely but weakly barred underparts, and the distinctive vocalisations, eliminate the possibility of a misidentification. These are the first records in the Sula Islands (White & Bruce 1986, Coates & Bishop 1997) and the westernmost of a species considered endemic to New Guinea and the Moluccas. Its occurrence on Taliabu suggests that the Moluccan element of the highland avifauna of the Sula Islands is more pronounced than anticipated. The only *Accipiter* previously assumed to occur on Taliabu is the much smaller Vinous-breasted Sparrowhawk *A. rhodogaster sulaensis*. Given that most Indo-Pacific islands possess 2–3 resident *Accipiter* species of different sizes, the occurrence of larger *A. meyerianus* next to smaller *A. rhodogaster sulaensis* is unsurprising, although one might have expected a second *Accipiter* on Taliabu to be another Sulawesi element (e.g. Spot-tailed Goshawk *A. trinotatus*). Given my records of *A. meyerianus* on Taliabu, the presumption that *A. rhodogaster sulaensis* constitutes a Sulawesi element must be verified. Pronounced plumage differences exist between *A. r. rhodogaster* of mainland Sulawesi and *A. r. sulaensis* (Coates & Bishop 1997; pers. obs.), and their conspecificity might not withstand phylogenetic scrutiny.

SULA SCRUBFOWL *Megapodius bernsteinii*
Only two brief sightings, of singles flushed at *c*.50 m and 400 m in dense bamboo undergrowth and degraded secondary forest, respectively. Endemic to the Sula and Banggai islands (White & Bruce 1986), previous field work had shown the species to occur up to 250 m in Taliabu (Davidson *et al*. 1991), but my record and information from villagers in Binadesa indicate that it might reach 200–300 m higher. According to the same villagers *M. bernsteinii* is intensively hunted for its tasty meat and its eggs are taken for human consumption. It must now be exceedingly rare on Taliabu given dramatic habitat degradation, hunting and egg collecting. An indication of its apparent decline is the scarcity of records during the present survey compared with the encounter rates by Davidson *et al*. (1991) and F. Verbelen (pers. comm.). Fishermen from Jorjoga (in north Taliabu) reported that the species has declined steeply on its tiny nesting islands off the north coast (e.g. Samada Besar) where it was formerly common. Nonetheless, the species' persistence in dense secondary bamboo thickets in the vicinity of villages indicates that it might be somewhat resistant to habitat destruction. But, given that undisturbed habitat at its preferred elevations has been reduced to tiny fragments, there are probably no large populations that could source re-expansions in the case of local extinctions of small populations. The situation might be equally dire elsewhere, e.g. in eastern Peleng in the Banggai Archipelago, where dramatic declines have occurred over the last decade (M. Indrawan pers. comm.). *M. bernsteinii* is listed as Near

TABLE 1

Species encountered on Taliabu (excluding seabirds close to shore), but not mentioned in the main text.

Species	Comment
Great-billed Heron *Ardea sumatrana*	One near Jorjoga
Brahminy Kite *Haliastur indus*	-
Sulawesi Serpent Eagle *Spilornis rufipectus sulaensis*	1+1
Rufous-bellied Eagle *Hieraaetus kienerii*	Minimum of two adults at 800 m
Vinous-breasted Sparrowhawk *Accipiter rhodogaster sulaensis*	One adult at 200 m
Spotted Kestrel *Falco moluccensis*	-
Common Sandpiper *Actitis hypoleucos*	-
Emerald Dove *Chalcophaps indicus*	Common to minimum of 400 m
Silver-tipped Imperial Pigeon *Ducula luctuosa*	Up to 200 m
Maroon-chinned Fruit Dove *Ptilinopus subgularis mangoliensis*	Common by voice to 1,100 m although shy and affording few good views
Black-naped Fruit Dove *P. melanospila chrysorrhoa*	Common to 1,100 m
Grey-cheeked Green Pigeon *Treron griseicauda*	Common to *c.*250 m
Yellow-and-green Lorikeet *Trichoglossus flavoviridis flavoviridis*	Common to 1,100 m
Golden-mantled Racquet-tail *Prioniturus platurus sinerubris*	Up to 1,100 m, common higher up
Moluccan King Parrot *Alisterus amboinensis sulaensis*	A few sightings at 0–700 m
Black-billed Koel *Eudynamys melanorhynchus*	Not seen, only heard twice
Great Eared Nightjar *Eurostopodus macrotis macropterus*	Common in lowlands
Sulawesi Nightjar *Caprimulgus celebensis jungei*	Brief sighting at 50 m; vocalisations (similar to those of nominate race) heard twice
Glossy Swiftlet *Collocalia esculenta*	-
White-throated Needletail *Hirundapus caudacutus*	1+1
Ruddy Kingfisher *Halcyon coromanda sulana*	A few sightings to 500 m
Collared Kingfisher *H. chloris*	1–2 at 50 m
Sacred Kingfisher *H. sancta*	3–4 at sea level
Variable Dwarf Kingfisher *Ceyx lepidus wallacii*	Several at 0–500 m
Common Dollarbird *Eurystomus orientalis*	2–3 at 50 m
Rainbow Bee-eater *Merops ornatus*	-
Grey Wagtail *Motacilla cinerea*	Common
Pacific Swallow *Hirundo tahitica*	-
Sula Cicadabird *Coracina sula*	Common at 0–1,100 m
Sulawesi Triller *Lalage leucopygialis*	Common up to 100 m in degraded habitat
Slender-billed Crow *Corvus enca mangoli*	Common to 150 m in degraded habitat
Arctic Warbler *Phylloscopus borealis*	Heard and seen in lowlands until 9 April
Henna-tailed Jungle Flycatcher *Rhinomyias colonus colonus*	A few sightings, mostly in bamboo, to 200 m
Grey-streaked Flycatcher *Muscicapa griseisticta*	Common to 1,100 m
Little Pied Flycatcher *Ficedula westermanni*	*c.*900–1,100 m
Common Golden Whistler *Pachycephala pectoralis clio*	Common 0–1,100 m
Ivory-backed Woodswallow *Artamus monachus*	A few sightings near the coast
Bare-eyed Myna *Streptocitta albertinae*	2+1; only in emergent trees in agricultural plantations
Moluccan Starling *Aplonis mysolensis sulaensis*	Common in the lowlands
Helmeted Myna *Basilornis galeatus*	Common and seen daily up to 1,100 m
Brown-throated Sunbird *Anthreptes malacensis extremus*	-
Olive-backed Sunbird *Cinnyris jugularis robustirostris*	-
Black Sunbird *Leptocoma sericea auriceps*	-
Grey-sided Flowerpecker *Dicaeum celebicum sulaense*	Common at 0–1,100 m
Black-faced Munia *Lonchura molucca*	-

Threatened (Birdlife International 2009), but might merit upgrading to Vulnerable or even Endangered based on such potentially steep rates of decline throughout its range.

WHITE-THROATED PIGEON *Columba vitiensis halmaheira*
An adult was observed in logged forest at *c*.900 m and a captive bird held by villagers in Binadesa was photographed. The latter had been collected as a chick at an unknown location. Although the species was known from Taliabu (White & Bruce 1986, Coates & Bishop 1997), there was no previous information on its elevational range.

SULAWESI BLACK PIGEON *Turacoena manadensis*
Common in degraded orchards and secondary forest in the lowlands to 500 m, which constitutes a slight extension of its elevational range on Taliabu, as previous records were unavailable above *c*.300 m (Davidson *et al*. 1991).

BROWN CUCKOO-DOVE *Macropygia amboinensis sedecima*
Represented on the Sula Islands by an endemic subspecies (*sedecima*), which closely resembles Sulawesi *M. a. albicapilla* (White & Bruce 1986, Coates & Bishop 1997). Common to *c*.1,100 m in a range of forest habitats. Previous records of this subspecies have all been from below *c*.300 m (Davidson *et al*. 1991), thus my records considerably extend this taxon's elevational range.

GREEN IMPERIAL PIGEON *Ducula aenea sulana*
Common to *c*.1,000 m in a range of forest habitats. The local taxon *D. a. sulana* is restricted to the Banggai and Sula groups but closely resembles Sulawesi *D. a. paulina* (White & Bruce 1986, Coates & Bishop 1997). Davidson *et al*. (1991) recorded it below *c*.400 m on Taliabu, thus my records constitute a considerable elevational extension.

WHITE-BELLIED IMPERIAL PIGEON *Ducula forsteni*
Common from sea level to at least 1,100 m in secondary logged forest to undisturbed forest, although it tended to be much commoner in the latter. Above 800 m, the species was extremely abundant in the afternoons, with up to 80 seen in flight together. Previous records from Taliabu were not made above 200 m (Davidson *et al*. 1991). My records indicate that this pigeon's distribution on Taliabu is centred at higher elevations rather than near the coast.

SULA HANGING PARROT *Loriculus sclateri sclateri*
Collar's (2007) treatment of Sula Hanging Parrot *L. sclateri* as distinct from the Moluccan Hanging Parrot *L. amabilis* is adopted here. Nominate *L. s. sclateri* is endemic to the Sula Islands, whereas *L. s. ruber* occurs on the Banggai Islands. Previously published records of the nominate subspecies range up to *c*.250 m (Davidson *et al*. 1991), but I found *L. s. sclateri* common in degraded forest to at least 750 m, indicating a wider elevational range.

RUSTY-BREASTED CUCKOO *Cacomantis sepulcralis* (*virescens*?)
Seen and heard on several occasions in disturbed forest from near sea level to *c*.1,000 m. Sound-recordings were obtained twice (e.g. Fig. 3). Previous field workers have not remarked on the elevational occurrence of this species on Taliabu (Davidson *et al*. 1991, Coates & Bishop 1997). My records suggest a wide elevational distribution on Taliabu.

The taxonomy of Rusty-breasted Cuckoo *C. sepulcralis* of South-East Asia and the closely related Brush Cuckoo *C. variolosus* of the Australo-Papuan region is confusing.

White & Bruce (1986) resurrected the original treatment as two species. For a long time before—and occasionally afterwards (e.g. Payne 1997, 2005)—they were usually considered conspecific, but more recent work indicates that more than two species might be involved (e.g. Rheindt & Hutchinson 2007). Most taxa in the *C. sepulcralis / variolosus* complex possess two common vocalisation types: (1) a trisyllabic series repeated at rising frequencies, sometimes to the typical feverish pitch of *Cacomantis* cuckoos; and (2) a series of single call notes usually repeated at level frequency. Despite the general uniformity of these two vocal types across the complex, there appear to be consistent differences in their delivery among named taxa (pers. obs.). One, *C. s. aeruginosus* from the southern Moluccas (i.e. Buru and Seram), frequently utters a very distinct variant of the second call type that is superficially dissimilar from other *C. sepulcralis* vocalisations. This unusual variant was illustrated by Rheindt & Hutchinson (2007) as a series of several dozen notes—partially level and partially rising—in stark contrast to the usually shorter level call series given by *C. variolosus* and other subspecies of *C. sepulcralis*. Vocally, *C. s. aeruginosus* appears more different from the remaining taxa of this complex than other subspecies of *C. sepulcralis* are from *C. variolosus*. However, *C. s. aeruginosus* on Seram has also been heard giving the typical short and level variant of the second call type (pers. obs.; R. O. Hutchinson pers. comm.), although rate of delivery might be more rapid than in other subspecies (R. O. Hutchinson pers. comm.). A comprehensive bio-acoustic or genetic study of all major taxa, including *C. s. aeruginosus*, is urgently required to clarify their evolutionary history.

Birds on the Sula Islands were attributed to the southern Moluccan taxon *C. s. aeruginosus* by White & Bruce (1986) and Coates & Bishop (1997). If corroborated, this would be an unusual biogeographic pattern in which the Sula population is considered more akin to a taxon from the southern Moluccas rather than to neighbouring taxa on Sulawesi or the northern Moluccas. However, given the highly unusual voice of *C. s. aeruginosus* compared to Sulawesi *C. s. virescens* at least, this taxonomic arrangement can be tested in the field. Sound-recordings from Taliabu obtained by me constituted short level series' very similar in sonographic appearance and delivery timing to those of *C. s. virescens* (Fig. 3), and very unlike the long call series of *C. s. aeruginosus* (cf. Rheindt & Hutchinson 2007). Additionally, F. Verbelen (pers. comm.) obtained identical recordings in March 1997. Although it cannot be eliminated that Taliabu birds utter the long call series of *C. s. aeruginosus* at other seasons, the short call series presented in Fig. 3 does not appreciably differ from *C. s. virescens*. It could be argued that the patterns noted here are more parsimoniously explained by the affinity of Taliabu birds to *C. s. virescens* rather than to *C. s. aeruginosus*, although vocal samples from other seasons are desirable.

White & Bruce (1986) reported wintering Australian *C. variolosus* on Taliabu, making confusion with this taxon a confounding factor. While the short level series uttered by *C. variolosus* is acoustically similar to vocal type 2 in most subspecies of *C. sepulcralis* (see above), they possess a different sonographic signature with tilda-shaped (rather than hook-shaped) individual call elements (Fig. 3; see also www.xeno-canto.org/asia). Birds recorded on Taliabu do not exhibit the tilda-shaped notes characteristic of *C. variolosus*, but the hook-shaped ones of *C. s. virescens* (Fig. 3A). Moreover, the present records from as early as 5 April, and especially F. Verbelen's (pers. comm.) March records, would be unusually early for migrant *C. variolosus* this far north.

LESSER COUCAL *Centropus bengalensis javanensis*

Common in disturbed second growth, especially grassy pastures, from sea level to *c*.1,000 m. The species must have become common on Taliabu following widespread anthropogenic habitat conversion. Previously recorded only in the lowlands (Davidson *et al*. 1991), it was found in grassy pastures in the burnt highlands during my survey. Over large areas of montane grasslands it was generally the only bird species detected, indicating that the species quickly colonises grassy habitat at any elevation and also supporting the notion that montane grasslands on Taliabu are of recent fire-induced origin, with few bird species having adapted to them.

TALIABU MASKED OWL *Tyto nigrobrunnea*
Seen twice and photographed (Fig. 4) in dense secondary bamboo thickets near Binadesa at *c.*50 m, and seen in heavily logged forest with no understorey at *c.*900 m. Its voice—a hissing sound typical of the genus—was heard but not sound-recorded at both sites. Previously recorded just twice: (1) when the holotype was collected in 1938 and (2) a sight record along a logging track in the lowlands by Davidson *et al.* (1991). *T. nigrobrunnea* is assumed to be forest-dependent and might have declined in recent decades due to habitat destruction (Davidson *et al.* 1991). However, my records suggest it can occupy second growth and bamboo thickets in the vicinity of habitation. Villagers at Binadesa know *T. nigrobrunnea* well, and frequently see and hear it nearby. My survey produced three records, despite that nocturnal surveys were discontinued following the first sighting, suggesting the species would have been recorded more frequently given appropriate effort. The lack of records by previous visitors might be attributable to its shy and nocturnal habits, or to seasonal vocal inactivity. Considered endemic to Taliabu, future work on Mangole and perhaps Sanana should reveal its presence. Given its broad elevational range in disturbed habitat, *T. nigrobrunnea* is probably not threatened. One reason that *T. nigrobrunnea* has successfully adapted to disturbed habitats could be the absence of an open-country congener. On other islands (e.g. Sulawesi) with more than one *Tyto* species, forest-dependent taxa appear unable to colonise disturbed habitats because their open-country congeners have already filled that ecological niche.

SULA SCOPS OWL *Otus sulaensis*
I follow a study by King *et al.* (submitted) in recognising Sula Scops Owl *O. sulaensis* as a species distinct from Moluccan Scops Owl *O. magicus* and Banggai Scops Owl *O. mendeni*. The rationale for this is the distinct vocalisation of *O. sulaensis* compared to *O. magicus* and—to a much lesser extent—*O. mendeni*. During my survey, the species proved common from sea level to at least 1,100 m in forest ranging from disturbed to primary. Ecological data for *O. sulaensis* is limited on account of the confused taxonomic history of *Otus* populations on the Sula Islands. Davidson *et al.* (1991) repeatedly encountered an *Otus* in forest up to 800 m, but attributed their sightings to a potentially undescribed taxon, whilst stating that '*O. m. sulaensis* [was] not recorded by the expedition'. Undoubtedly, they were confused by the highly distinct vocalisations of this owl, which do not bear any resemblance to *O. magicus*.

UNIFORM SWIFTLET *Aerodramus vanikorensis*
Several flocks, from near sea level to over 1,100 m, with the first sighting on 10 April 2009. These flocks were observed feeding over habitats ranging from palm plantations to undisturbed montane forest. Identification was unequivocal, as the birds did not exhibit any white or otherwise pale area on the rump. Special consideration was given to Moluccan Swiftlet *A. infuscatus* from the northern Moluccas as a potential confusion risk, as its pale rump is not always readily visible. However, my records involved flocks of dark-rumped birds seen in very good light from ideal observation points, often feeding side-by-side with Glossy Swiftlet *Collocalia esculenta*. The latter appeared much smaller and displayed a contrasting white belly and green to blue gloss unlike the more uniformly drab

A. vanikorensis. On several occasions *A. vanikorensis* was observed uttering a distinctive chattering vocalisation in flight, as I had heard from the species elsewhere. Mine are the first observations on the Sula Islands. The species is probably widespread there, but might have been overlooked due to difficulties in identification. It has recently been recorded on the Banggai Islands (Rheindt *et al.* submitted), indicating that its Wallacean distribution could be much more extensive than generally assumed.

GREY-RUMPED TREESWFT *Hemiprocne longipennis wallacii*

Common in a range of secondary forest and agricultural habitats from sea level to *c.*800 m, with large flocks regular at a logging camp at 800 m in heavily logged forest, where the species might breed. Davidson *et al.* (1991) reported it from the lowlands of Taliabu, but the species is clearly more extensively distributed over the island.

RED-BELLIED PITTA *Pitta erythrogaster dohertyi*

Only three visual encounters during the survey, but it was commonly heard to at least 600 m. *P. e. dohertyi* has adapted to heavily disturbed secondary forest and bamboo thickets, albeit at presumably reduced densities, and was often heard in bamboo around Binadesa. Previous records from Taliabu were all from below 200 m (Davidson *et al.* 1991), thus my records indicate a wider elevational range. I follow White & Bruce (1986), Coates & Bishop (1997) and Erritzoe (2003) in considering *P. e. dohertyi* from the Sula and Banggai islands as a race of Red-bellied Pitta *P. erythrogaster*, but it has been treated specifically, as Sula Pitta *P. dohertyi*, by Sibley & Monroe (1990), Davidson *et al.* (1991) and Lambert & Woodcock

Legends to figures on opposite page

Figure 2. Meyer's Goshawk *Accipiter meyerianus*, Taliabu, April 2009 (F. E. Rheindt)

Figure 3. Sonogram of the calls of Rusty-breasted Cuckoo *Cacomantis sepulcralis* and Brush Cuckoo *C. variolosus* from various parts of their range. X-axis = time in seconds (0.5 seconds per tick), y-axis = frequency in kHz (2 kHz per tick). All three sonograms are at identical scale. A: *C. sepulcralis* (probably *virescens*) Taliabu (1,000 m), by F.E. Rheindt; B: *C. s. virescens* Lore Lindu National Park (central Sulawesi), by D. Farrow (source: www.xeno-canto.org/asia); C: *C. variolosus* Roti Island (Nusa Tenggara), by Colin Trainor (source: www.xeno-canto.org/asia).

Figure 4. Taliabu Masked Owl *Tyto nigrobrunnea*, Taliabu, April 2009; note the dark suffusion to the facial mask (F. E. Rheindt)

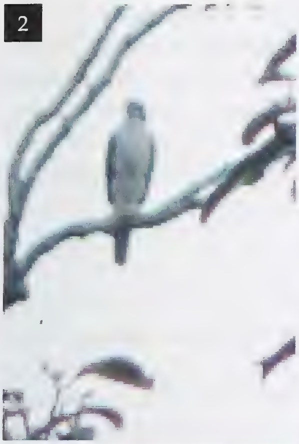
Figure 5. Island Thrush *Turdus poliocephalus*, at 1,050 m on Taliabu, April 2009; note the uniformly dark head and belly that set it apart from neighbouring *T. p. deningeri* from Seram (which has a pale head) and various taxa on Sulawesi (which have reddish belly tones) (F. E. Rheindt)

Figure 6. Sonograms of vocalisations of *Bradypterus* bush warblers. X-axis = time in seconds (0.5 seconds per tick), y-axis = frequency in kHz (2 kHz per tick). All sonograms are at identical scale. (A) 'Taliabu' Bush Warbler *Bradypterus* sp. by F. E. Rheindt (April 2009, Taliabu); (B) Benguet Bush Warbler *B. seebohmi* by R. O. Hutchinson (February 2007, Mount Polis, Luzon, Philippines); (C) Russet Bush Warbler *B. mandelli* by D. Farrow (no date, Thailand, source: www.xeno-canto.org/asia); (D) Chestnut-backed Bush Warbler *B. c. castaneus* by P. Noakes (September 2006, Lore Lindu, central Sulawesi; source: www.xeno-canto.org/asia); (E) Chestnut-backed Bush Warbler *B. c. musculus* by R. O. Hutchinson (September 2006, Kobipoto Ridge, Seram). Dark areas below 5 kHz in sonogram A are mechanical sound pollution from equipment. Note that the undescribed Taliabu birds (A) more closely resemble *B. mandelli* (C) in terms of frequency (centred around 6 kHz), and resemble *B. mandelli* (C) and *B. seebohmi* (B) in exhibiting a single repeated call element, as opposed to the *B. castaneus* complex (D, E) whose vocalisations involve 2–3 call elements given in rapid succession. In acoustic impression, Taliabu birds are most similar but not identical to *B. mandelli*.

Figure 7. Undescribed taxon belonging to the Island Leaf Warbler *Phylloscopus poliocephalus* complex; note the all-yellow underparts (including throat). Colours have not been modified using photo-editing software; even so, the underparts of this individual appear especially yellow in comparison to most others seen on Taliabu during the survey (F. E. Rheindt)

Figure 8. Mountain White-eye *Zosterops montanus*, Taliabu, April 2009; note the white or pale grey belly that aligns this population with the nominate subspecies (F. E. Rheindt)

Figure 9. Adult male Sulawesi Myzomela *Myzomela chloroptera*, Taliabu, April 2009; note the lack of apparent plumage differences from the populations on Sulawesi (by F. E. Rheindt)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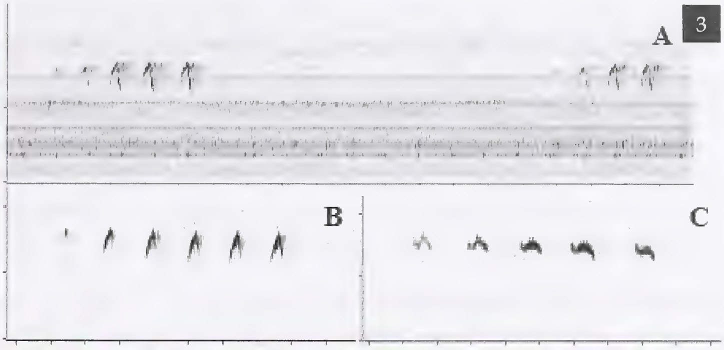
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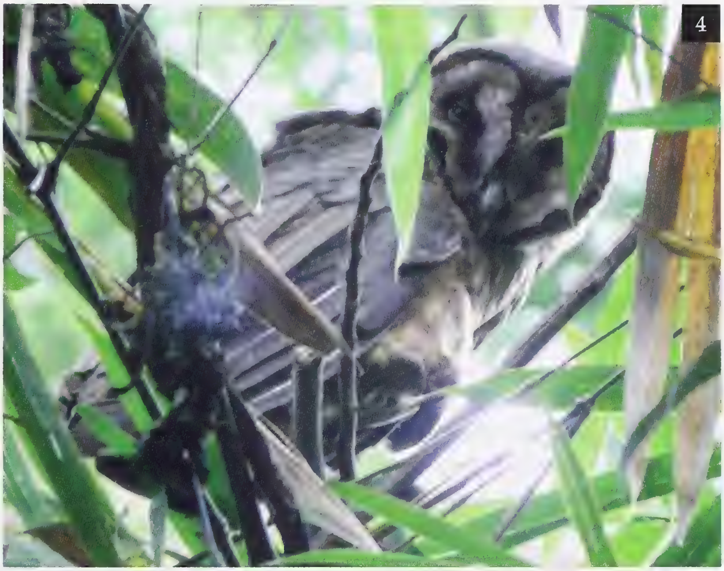
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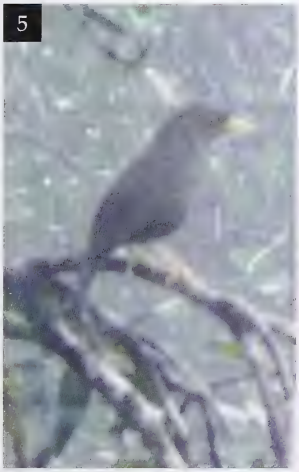
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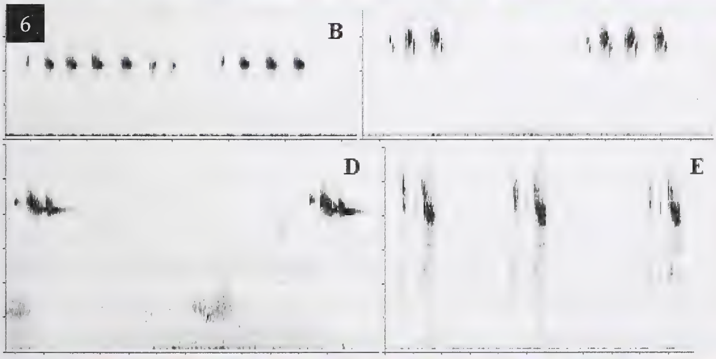
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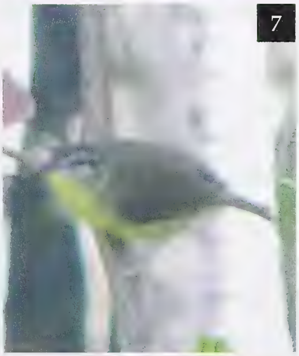
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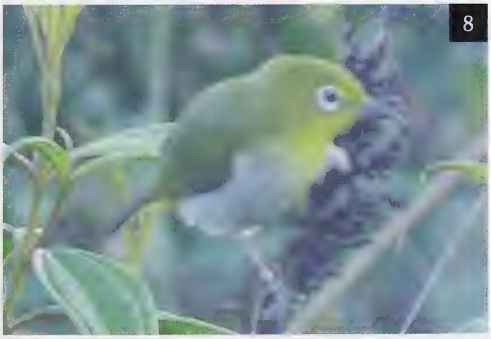
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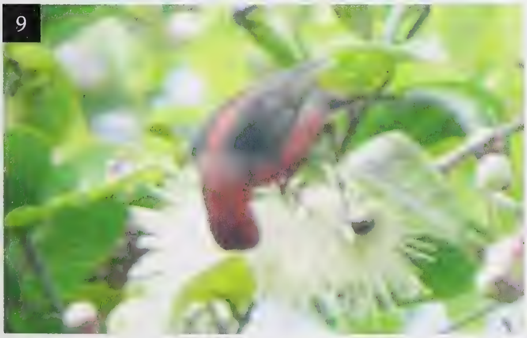
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(1996) based on head coloration, other minor plumage details and an allegedly distinctive vocalisation. However, Erritzoe (2003) dismissed the plumage differences as insufficient given that plumage variation in other *P. erythrogaster* taxa is considerable. Furthermore, studies of the Banggai population of *P. e. dohertyi* (Rheindt *et al.* submitted) suggest that the vocalisation cited by Lambert & Woodcock (1996) as evidence for elevating *P. e. dohertyi* to species status is a secondary vocalisation used by many *P. erythrogaster* taxa, and that *P. e. dohertyi* also utters the well-known main vocalisation of the species. Splitting *P. e. dohertyi* therefore appears unwarranted for now.

SLATY CUCKOOSHRIKE *Coracina schistacea*

Endemic to the Banggai and Sula islands, this species was common from near sea level to at least 1,100 m, especially in degraded and logged montane forest, but also in disturbed forest at lower elevations, often accompanying its endemic congener Sula Cicadabird *Coracina sula*. My records extend the elevational range on Taliabu from that reported by Davidson *et al.* (1991) and demonstrate that the species might be commoner at higher elevations.

NORTHERN GOLDEN BULBUL *Thapsinillas longirostris longirostris*

Common in most degraded and undisturbed habitats from near sea level to at least 1,100 m. Davidson *et al.* (1991) recorded it up to 800 m on Taliabu, but they did not ascend any higher than this. Photographs and sound-recordings made during my survey should assist future workers to elucidate the confused taxonomy of the Golden Bulbul complex. I follow Fishpool & Tobias (2005) and Rheindt & Hutchinson (2007) in considering taxa from the northern Moluccas, Sangihe, Sula, Banggai and Togian islands as a species, *T. longirostris*, distinct from taxa in the southern Moluccas. The taxon on the Sula Islands is *T.l. longirostris*. Preliminary comparisons of sound-recordings made during various visits to northern Wallacea suggest that *T. longirostris* might comprise several species, given consistent differences in their plumage and vocals, akin to the differences shown between taxa that comprise Fishpool & Tobias's (2005) Southern Golden Bulbul *T. affinis* (Rheindt & Hutchinson 2007). However, a comprehensive bio-acoustic or genetic analysis of all these northern taxa is needed before any further splits can be proposed.

HAIR-CRESTED DRONGO *Dicrurus hottentottus pectoralis*

Common in varied habitats, from disturbed orchards to undisturbed montane forest from near sea level to over 1,100 m. Davidson *et al.* (1991) reported it as common in forest up to 800 m (the highest elevation these authors attained). In the absence of any recent taxonomic revision, I follow traditional taxonomy as proposed by Vaurie (1949) and slightly modified by White & Bruce (1986), wherein most Moluccan and Sulawesi drongos are divided into two species, Hair-crested Drongo *D. hottentottus* in the west and Spangled Drongo *D. bracteatus* in the east. However, Rheindt & Hutchinson (2007) suggested that this probably does not reflect true species limits and requires fresh analysis using bio-acoustic and / or genetic data. More detailed work is especially relevant in respect of the endemic Sula taxon *D. h. pectoralis*, which is considered part of the same species as neighbouring *D. h. leucops* from Sulawesi, despite being much smaller and differing greatly in iris colour and vocalisations (Coates & Bishop 1997; pers. obs.). In appearance, *D. h. pectoralis* appears relatively distinct for a drongo and more closely resembles *D. bracteatus* taxa from the Moluccas than its Sulawesi neighbour (Coates & Bishop 1997). Molecular analysis might reveal *D. h. pectoralis* to represent a genetically distinct lineage that merits treatment at species level.

BLACK-NAPED ORIOLE *Oriolus chinensis frontalis*

Represented on the Banggai and Sula islands by an endemic race, *O. c. frontalis*, previous Sula records were all from below 300 m on Taliabu (Davidson *et al.* 1991), yet I found *O. c. frontalis* common in degraded and logged forests and orchards to *c.*800 m.

ISLAND THRUSH *Turdus poliocephalus* (undescribed subspecies)

On 8, 9, 14 and 15 April 2009, singles were seen in a patch of dense montane dwarf forest at *c.*1,050 m. Initially noted by its alarm call, which resembles that of a Eurasian Blackbird *Turdus merula*, around noon on 8 April, with the first sighting *c.*3 hours later. All sightings were made in a radius of 200 m. On 9 April 2009, a photograph was taken in heavy rain (Fig. 5), which shows the plumage coloration of the bird involved.

This is the first record of Island Thrush *T. poliocephalus* from the Sula Islands, despite that it is widespread on numerous islands in the Australo-Pacific region, where it is generally—but not always—restricted to dwarf forest at the treeline or in alpine bushland and grassland above this (Clement & Hathway 2000, Collar 2005). The geographically most proximate subspecies of *T. poliocephalus* to Taliabu are *T. p. deningeri* from Seram and *T. p. hygroscopus* and *T. p. celebensis* from south-west and south Sulawesi, respectively. However, the two Sulawesi taxa are complemented by two more potential subspecies from central and eastern Sulawesi as yet undescribed (White & Bruce 1986, Coates & Bishop 1997, Collar 2005). The Island Thrush complex is not only characterised by substantial morphological variability, but also by a leapfrogging pattern in which taxa with allied plumage traits are irregularly distributed (Collar 2005). From Fig. 5, it is evident that the population on Taliabu does not resemble any of its close neighbours, its head being uniformly dark (not pale grey as in *T. p. deningeri* on Seram) and its underparts lacking any of the reddish tones of the taxa from Sulawesi. Thus, the Taliabu population warrants subspecific recognition once specimens have been collected. Although several geographically distant races from as far afield as the Philippines and New Guinea resemble the new population in plumage (Collar 2005), its closest affinities can only be determined genetically, as the dark ventral and head plumage exhibited by Taliabu birds might be an ancestral character lost in neighbouring subspecies. A genetic analysis by Jones & Kennedy (2008) showed that several similar races of Island Thrush from the Philippines are not each other's closest relatives.

The Taliabu population of *T. poliocephalus* must be rare. Appropriate elevations were visited on nine days, yet the species was seen just four times and heard a few more. More significantly, all encounters were in a small area of dwarf montane forest at 1,050 m, which tract was the only one encountered during my survey. Other areas at appropriate elevations were either burnt grassland and bushland, resulting from recent forest fires, or had been partially logged and lacked a true understorey. Although *T. poliocephalus* is known to inhabit natural alpine grassland elsewhere (e.g. New Guinea), it does not occur in the extensive recently created grasslands in the highlands of Taliabu.

The discovery of a new taxon of *T. poliocephalus* on Taliabu indicates that other islands might also hold new populations of this species. As *T. poliocephalus* usually occurs near the treeline or higher, it is often under-recorded by ornithologists, many of whom do not ascend sufficiently high during surveys. If *T. poliocephalus* occurs at just over 1,000 m on Taliabu, other Wallacean islands with even higher elevations could harbour habitat suitable for the species. Future searches should concentrate on Halmahera and its satellites (such as Bacan and Obi) or Buru. Higher mountains in the interior of Buru have long been neglected by ornithologists but were visited recently by an ornithological expedition (Rheindt & Hutchinson 2007) that did not quite attain altitudes suitable for *T. poliocephalus*, whilst the highlands of Halmahera, Bacan and Obi are notoriously under-studied despite the large number of recreational birdwatchers visiting Halmahera in pursuit of its lowland species.

'TALIABU BUSH WARBLER' *Bradypterus* sp.

On 9 April 2009, following a long heavy rain shower, an unfamiliar vocalisation reminiscent of Russet Bush Warbler *Bradypterus mandelli* was briefly heard from a patch of dense montane dwarf forest at *c*.1,050–1,100 m. The vocalisation was instantly recognised as a *Bradypterus*, a montane genus not previously recorded on the Sula Islands. It was not heard again that day, but a few days later, and after searching other (fire-impacted) highland sites without success, I revisited the same forest on 14–15 April. Despite rain and little vocal activity, I heard this bush warbler ten more times. Song bouts were usually too short (<30 seconds) to approach the bird closely, but once on 15 April a close bird was briefly seen in the dense undergrowth. Its coloration appeared typical of the genus, brown with a well-developed white supercilium. The bird appeared large, especially compared to Chestnut-backed Bush Warbler *B. castaneus* from Sulawesi, which was seen just a few days before and after my visit to Taliabu. However, these morphological traits require confirmation. No photographs were obtained, but low-quality sound recordings were made, the best of which (Fig. 6A) was used to lure the bird that was seen.

Bradypterus is represented in northern Wallacea by the *B. castaneus* complex: *B. c. castaneus* on Sulawesi, *B. c. musculus* on Seram and *B. c. disturbans* on Buru (White & Bruce 1986, Coates & Bishop 1997). Whilst the nominate form is well known from several sites on Sulawesi, the taxa on Seram and Buru have—until recently—been almost unknown and biological data are scarce. Rheindt & Hutchinson (2007) documented the vocalisation and plumage of *B. c. musculus* from Seram and concluded that it can hardly be included in the same biological species as *B. c. castaneus*. However, due to the lack of sound-recordings and photographs of the geographically intermediate *B. c. disturbans* from Buru, they did not propose species status for *B. c. musculus*, despite that the vocalisations of *B. c. disturbans* do not sound like *B. c. castaneus* or *B. c. musculus*.

The bush warbler on Taliabu exhibits a highly distinct vocalisation typical of the genus by virtue of its insect-like quality, but acoustically distinct from any of the *B. castaneus* complex (see Fig. 6; differences from *B. c. disturbans* based on pers. obs.). In terms of frequency and structure, its song more closely resembles *B. mandelli* from the Asian mainland or one of its island offshoots, such as *B. seebohmi* from the Philippines (Fig. 6). However, this would hardly warrant placing the Taliabu birds with that species, as there are pronounced differences in element spacing and note shape between them, rendering any resemblance superficial at most (Fig. 6).

Based on the bio-acoustic evidence, this new *Bradypterus* probably deserves species status. Its evolutionary origins and genetic affinities require elucidation. The superficial resemblance to the *B. seebohmi / mandelli* complex (rather than the geographically adjacent *B. castaneus* complex) may point to its true affinities, or might be an artefact based on convergence or the retention of ancestral vocal traits. Molecular methods are required to resolve its phylogenetic relationships, and its formal description would benefit from the addition of such analysis.

'Taliabu' bush warbler must be rare. I found it in just one tract of montane dwarf forest, despite ample search effort in other areas at suitable elevations especially to find this bird. Most areas above 1,000 m accessed by me were heavily degraded with a disturbed understorey due to logging using heavy machinery. However, an even greater threat is probably posed by the recent large-scale destruction of highland forest by fire, which has accounted for *c*.70% of montane forest in the watersheds investigated during my survey (estimated from GoogleEarth satellite imagery). Once it is formally described, this bush warbler might require Red Data listing.

MOUNTAIN TAILORBIRD *Orthotomus cuculatus* (undescribed subspecies?)
Davidson *et al.* (1991) presented the first records for the Sula Islands, and described the species as inhabiting montane forest above 500 m. I found it common in disturbed (less commonly within intact) montane forest to over 1,100 m, with a few records in dense secondary bamboo thickets down to 50 m. The species is apparently naturally absent from lowland forest but tolerates lower elevations in degraded bamboo. Davidson *et al.* (1991) considered it probable that the Taliabu birds require recognition at subspecies level. In Wallacea, *O. cuculatus* is currently subdivided into many island races, with Sulawesi possessing several races and additional unnamed populations that perhaps require taxonomic recognition, despite being generally poorly differentiated (White & Bruce 1986, Coates & Bishop 1997). It is therefore conceivable that the Taliabu birds should be named. Genetic and bio-acoustic studies should shed light on whether the current taxonomic treatment of this species in Wallacea is appropriate.

ISLAND LEAF WARBLER *Phylloscopus* [*poliocephalus*] (undescribed taxon)
Davidson *et al.* (1991) were the only previous ornithologists to find a resident population of *Phylloscopus* leaf warbler on Taliabu, which they found to be common in montane forest above 750 m and which they considered to represent an undescribed subspecies of the polytypic Island Leaf Warbler *P. poliocephalus*. During my field work, this leaf warbler was common in degraded to less-disturbed montane forest from 700 to at least 1,100 m. Poor to average photographs (e.g. Fig. 7) and good sound-recordings were obtained. Rheindt & Hutchinson (2007) asserted that the *P. poliocephalus* complex probably consists of several species-level insular taxa and presented evidence for dramatic vocal and plumage differences between two constituent taxa, *P. p. everetti* from Buru and *P. p. ceramensis* from Seram. Rheindt & Hutchinson (2007) did not propose any splits, because some relevant taxa have not yet been sampled bio-acoustically, and they recommended that taxonomic revision should be based on comprehensive vocal and / or genetic analyses of most constituent taxa. Preliminary comparison of vocal and photographic material from Taliabu with Rheindt & Hutchinson's (2007) material from Buru and Seram suggests that the Taliabu birds cannot be unambiguously assigned to either of the two southern Moluccan taxa. It is probable that future bio-acoustic analysis will reveal the Taliabu birds to form a biological species apart from the rest of the *P. poliocephalus* complex. Once specimens become available, formal description of the birds on Taliabu should be undertaken in combination with a detailed acoustic, morphological and—if possible—genetic comparison with the rest of the complex.

MOUNTAIN WHITE-EYE *Zosterops montanus* (undescribed subspecies?)
Davidson *et al.* (1991) discovered this species in montane forest on Taliabu above 800 m and speculated that it replaces the common lowland Black-fronted White-eye *Z. atrifrons sulaensis* at higher altitudes. Mountain White-eye *Z. montanus* is widespread in the Indonesian and Philippine archipelagos, and has been divided into numerous insular subspecies (Mees 1957, van Balen 2008). In Wallacea, two prominent plumage types exist: (1) yellow-bellied birds on Ternate, Tidore and Seram which are usually considered as *Z. m. obstinatus*; (2) white-bellied birds in the Lesser Sundas, Sulawesi and Buru, which are treated as nominate *Z. m. montanus* by most authors (e.g. van Balen 2008). I found *Z. montanus* common in montane forest and bushland from 750 m to over 1,100 m, with two records from 650 m. Across this

range, *Z. montanus* was commonly sympatric with *Z. atrifrons sulaensis* and was even seen in the same mixed-species flocks, although *Z. montanus* usually kept to lower vegetation. The two species therefore do not replace each other elevationally, although they do largely keep to different strata. Photographs (Fig. 8) reveal that the Taliabu population is white-bellied (or pale grey-bellied) akin to neighbouring populations on Sulawesi and Buru, making it best to attribute it to nominate *Z. m. montanus* for now. Genetic analysis might reveal that Wallacean populations currently attributed to nominate *montanus* are distinct. Since the holotype of *Z. montanus* is from Sumatra, this name would no longer apply to the subspecies in Wallacea, in which case Taliabu birds might be subsumed with either those on Buru or Sulawesi, or be recognised subspecifically, as suggested by Davidson *et al.* (1991). For now, such treatment would be premature and retention of all white-bellied Wallacean forms in the nominate subspecies appears preferable.

BLACK-FRONTED WHITE-EYE *Zosterops atrifrons sulaensis*
Davidson *et al.* (1991) found this species only in the lowlands and thought it was replaced by *Z. montanus* in montane forest. I found it common on Taliabu from near sea level to over 1,100 m, and the species is widely sympatric with *Z. montanus*, although it generally keeps to higher strata in the forest. Rasmussen *et al.* (2000) concluded that the endemic *Z. a. sulaensis* exhibits significant differences from the Sulawesi races, *Z. a. atrifrons* and *Z. a. surda*, in terms of eye-ring width and dawn song vocalisations, but stopped short of elevating *Z. a. sulaensis* to species level because of a lack of vocal data for the Banggai subspecies *Z. a. subatrifrons*, which is intermediate in plumage traits. More recently, Rheindt *et al.* (submitted) found that vocally *Z. a. subatrifrons* differs vastly from the Sula and Sulawesi taxa, thereby supporting elevation of *Z. a. sulaensis* to species level, given the lack of vocal intermediacy between birds on Sula and elsewhere.

SNOWY-BROWED FLYCATCHER *Ficedula hyperythra* (undescribed subspecies?)
One adult male in the interior of undisturbed primary montane dwarf forest at *c.*1,100 m. Discovered on Taliabu by Davidson *et al.* (1991), who recorded it in montane forest above 800 m. Its scarcity during my survey could be due to the species' unobtrusive habits, and because intact montane forest interior was difficult to access via logging tracks. Davidson *et al.* (1991) contended that the Taliabu population may warrant recognition at subspecies level. In fact, Wallacean populations are split into a variety of poorly differentiated subspecies, each endemic to its own island or even peninsula, as in various Sulawesi races (White & Bruce 1986, Coates & Bishop 1997). Before naming the Taliabu population, a genetic analysis or—at the very least—a detailed morphological and bio-acoustic investigation involving most taxa from Wallacea, and beyond, is needed.

ISLAND VERDITER FLYCATCHER *Eumyias panayensis* (undescribed subspecies?)
Common from near sea level to *c.*1,000 m. Its song—primarily given at dawn and dusk—revealed it to be common in disturbed orchards and secondary forest, although it was also found in more undisturbed montane and submontane forest. Only recently discovered on Taliabu, where Davidson *et al.* (1991) thought it largely restricted to above 800 m, with a single sighting in the lowlands. My records indicate that it is more common in the lowlands than assumed by Davidson *et al.* (1991), who might have overlooked it at lower elevations, or perhaps *E. panayensis* has recently increased due to habitat disturbance, which could have induced birds to move downslope into edge habitats.

E. panayensis is patchily distributed throughout the Philippines and northern Wallacea, occurring on most larger and random smaller islands in the region. In Wallacea four poorly differentiated subspecies endemic to individual islands or even peninsulas, as on Sulawesi, are recognised (White & Bruce 1986, Coates & Bishop 1997). For convenience, the Taliabu population is currently assigned to *E. p. septentrionalis* from north and central Sulawesi by most authors, although Davidson *et al.* (1991) suggested that it might merit recognition as an endemic subspecies. Formal description of this population should be attempted as part of a detailed morphological and bio-acoustic analysis—potentially aided by genetic enquiry—to ascertain whether the current taxonomic treatment of this species in Wallacea is appropriate.

BLACK-NAPED MONARCH *Hypothymis azurea blasii*
This species—represented on Taliabu by *H. a. blasii* (which is endemic to the Sula and Banggai groups)—was common from near sea level to *c.*900 m in habitats ranging from orchards to undisturbed forest. Previous data on the elevational range of this subspecies exclusively refer to the lowlands, with Davidson *et al.* (1991) recording the species 'not . . . above c. 300 m'. My records considerably extend its range into the highlands.

ISLAND MONARCH *Monarcha cinerascens cinerascens*
Previous workers did not find this species on Taliabu above 200 m (Davidson *et al.* 1991), but I recorded it in degraded orchards to older secondary forest from near sea level to *c.*900 m, indicating a wider elevational range than was assumed.

RUSTY-BELLIED FANTAIL *Rhipidura teysmanni sulaensis*
Represented on the Sula Islands by the endemic *R. t. sulaensis* (White & Bruce 1986, Coates & Bishop 1997), Davidson *et al.* (1991) recorded it on Taliabu into montane forest. I encountered it from the lowlands to at least 1,100 m, and sound-recordings were obtained. Preliminary comparison of these with recordings of other *R. teysmanni* taxa and an undescribed population from the Banggai Islands suggest that *R. t. sulaensis* is vocally distinct (Rheindt *et al.* submitted).

CITRINE CANARY-FLYCATCHER *Culicicapa helianthea helianthea*
Common in degraded to undisturbed forest from the lowlands to *c.*800 m. Davidson *et al.* (1991) recorded it in ' . . . lowland forest types . . . ' only, but my survey demonstrates that its elevational range on Taliabu is wider.

DRAB WHISTLER *Pachycephala griseonota lineolata*
On the Sula Islands represented by the potentially endemic race *P. g. lineolata*. Davidson *et al.* (1991) reported it in 'lowland forest types' throughout Taliabu, but I found it common from near sea level to *c.*1,000 m. A good photograph of a female was taken at *c.*900 m, indicating that the species is by no means restricted to lowlands on Taliabu.

SULAWESI MYZOMELA *Myzomela chloroptera* (undescribed subspecies?)
I follow Salomonsen (1967), and thereafter Wolters (1979), Rheindt & Hutchinson (2007) and Higgins *et al.* (2008), in assigning species status to *M. chloroptera* from Sulawesi to the exclusion of the quite different-looking Wakolo Myzomela *M. wakoloensis*, Banda Myzomela *M. boiei* and Scarlet Myzomela *M. sanguinolenta*. Sulawesi Myzomela was first recorded on Taliabu by Davidson *et al.* (1991) who considered it a common inhabitant of montane forest above 800 m. I found the species abundant (with one photographed, Fig. 9) in montane forest to at least 1,100 m, but sporadic records were also made at tall flowering trees in the lowlands above *c.*100 m, indicating a wider elevational range than previously assumed.

Davidson *et al.* (1991) suggested that Taliabu birds might be subspecifically distinct from *M. chloroptera* on Sulawesi, but I did not notice any consistent plumage differences between them. A more detailed morphological investigation—and molecular analysis—is needed to establish whether the Taliabu population merits taxonomic recognition.

BLUE-FACED PARROTFINCH *Erythrura trichroa*

An individual apparently of this species was briefly seen in logged secondary forest at 900 m. It was initially detected giving an extremely high-pitched note, before alighting on a bare branch where it remained for no longer than one second. The tiny size, green overall colour and relatively heavy-based bill were noted, but the sighting was too brief to be conclusive. Not previously recorded on the Sula Islands, but occurrence is conceivable, given that it occurs in montane forest to the west (Sulawesi) and east (in the Moluccas: White & Bruce 1986). Future workers should look for the species on Taliabu.

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Notes on the birds of the Río Plátano Biosphere Reserve, including four new species for Honduras

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SUMMARY.—We detail records of 27 rare or poorly known species from the Río Plátano Biosphere Reserve (RPBR) in eastern Honduras. Four of these, Fasciated Tiger Heron *Tigrisoma fasciatum*, Grey-rumped Swift *Chaetura cinereiventris*, Striped Woodhaunter *Hyloctistes subulatus* and Wing-banded Antbird *Myrmornis torquata* have not previously been reported from Honduras.

The Caribbean slope lowlands and lower foothills of Central America form an area of endemism for birds (Peterson *et al.* 1998) and have been subject to ornithological investigation for over a century (Salvin & Godman 1879–1904). Despite this, most ornithological work has focused on easily accessible sites in southern Central America such as Barro Colorado Island in Panama (Karr 1990) and La Selva in Costa Rica (Slud 1960). Although humid lowland rainforest extends from eastern Honduras south and east to Panama, the true extent of many Caribbean slope bird species' ranges are poorly documented due to the difficulty of access to this region. Eastern Honduras hosts an extensive area of Caribbean slope humid forest, but is incompletely known to ornithologists (Marcus 1983, Anderson *et al.* 2004). Within this region, the Río Plátano Biosphere Reserve (RPBR) encompasses 5,250 km^2 in dptos. Gracias a Dios, Colón and Olancho, and spans the elevational range from sea level to 1,500 m. The RPBR, together with adjacent protected areas including Tawahka-Asangni Biosphere Reserve, Sierra de Agalta National Park, the proposed Patuca National Park, Rus Rus Biosphere Reserve, and Bosawás Biosphere Reserve in adjacent Nicaragua, form the largest remaining wilderness in Central America. This region is sparsely populated, with an estimated 3–5 human inhabitants / km^2, and includes extensive uninhabited areas. Because past anthropogenic alterations have been limited in extent, the area offers valuable opportunities to both researchers and conservationists. Previous investigations of the RPBR have concentrated on areas near the village of Las Marías (Marcus 1983, Anderson *et al.* 1998, 2004). To date, 496 bird species have been reported from the reserve (RJG pers. obs.). Below, we detail observations of 27 species, mostly from the upper drainage of the río Plátano, within the forested core of the RPBR, including two genera and four species not previously reported from Honduras.

Methods

We visited the upper drainage of the río Plátano during 28 March–4 April 2002 (RJG), 11–21 April 2003 (RJG), 30 July–11 August 2006 (ACV and RJG), 8–27 June 2008 (ACV and JSA), 3–14 February 2009 (RJG) and 22 April–2 May 2009 (ACV and RJG). During each visit, we searched for birds, primarily in humid lowland rainforest adjacent to the río Plátano. We estimated canopy height of the upper río Plátano forest at *c.*20–25 m and noted numerous large emergents over 35 m. The understorey was typically dense along the floodplain of the río Plátano and its tributaries, often with stands of palms, large-leaved herbs and lianas. Adjacent steep slopes and uplands hosted a more open understorey, in many areas with abundant rock outcrops. Most observations were made opportunistically along a network of existing trails and passable watercourses. During 8–27 June 2008, we supplemented

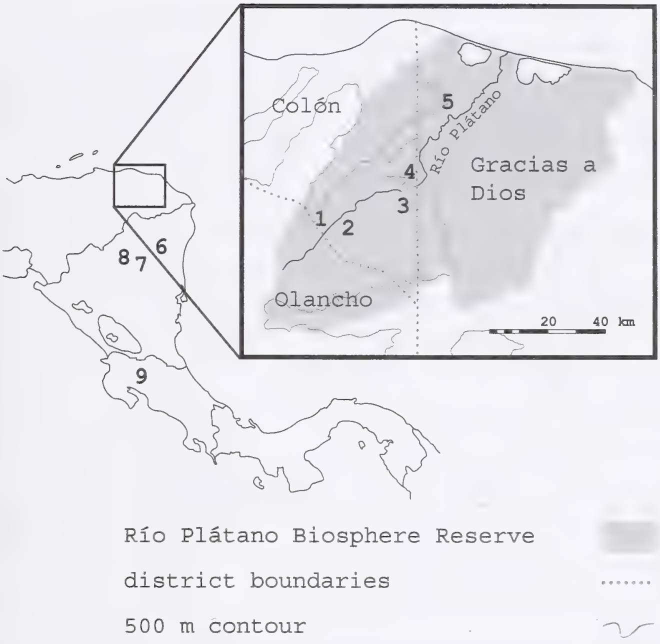


Figure 1. Map showing the location of the RPBR in Central America and the localities mentioned in the text: (1) La Carrizalosa camp, (2) La Cueva Camp, (3) El Subterráneo camp, (4) Pomokir camp, (5) Las Marias, (6) Eden, Nicaragua (7) Siuna, Nicaragua, (8) Peña Blanca, Nicaragua, (9) Cordillera de Guanacaste, Costa Rica.

this with a small number of mist-net captures. Coordinates for individual sites within the RPBR follow: La Carrizalosa Camp, Colón 15°19′56.13″N, 85°16′37.58″W; La Cueva camp, Colón 15°20′52.53″N, 85°14′51.50″W; El Subterráneo camp, Colón 15°26′06.48″N, 85°03′56.28″W; Pomokir camp, Colón 15°28′33.68″N, 84°59′53.82″W; Las Marías, Gracias a Dios 15°40′01.06″N, 84°53′51.92″W. The locations of these and most other localities mentioned in the text are presented in Fig. 1.

Species accounts

FASCIATED TIGER HERON *Tigrisoma fasciatum*

A scarce and local species mostly considered to range no further north than the Caribbean slope of Costa Rica (e.g. AOU 1998, Martínez-Vilalta & Motis 1992) where it was not documented until 1952 (Slud 1964). Whilst Hancock & Kushlan (1984) and Hancock (1999) mapped it in north-east Honduras, the source of this is unclear. ACV & RJG encountered an adult *T. fasciatum* on 1 August 2006 in the upper drainage of the río Plátano. ACV & JSA closely observed and photographed an adult at La Cueva camp on 16 June 2008, and an adult was seen briefly just below El Subterráneo camp on 19 June 2008. During 22 April–3 May 2009 ACV & RJG encountered at least three in the upper watershed and obtained several photographs (Fig. 1; images will also be archived at the Visual Resources for Ornithology [VIREO] collection, Philadelphia) below El Subterráneo camp, a range extension of >400 km from the nearest locality, the Cordillera de Guanacaste, Costa Rica (Stiles & Skutch 1989).

BLACK-AND-WHITE HAWK-EAGLE *Spizaetus melanoleucus*

Monroe (1968) listed just three records of this poorly known hawk from Honduras, and the species is generally regarded as scarce and local over its extensive range. Anderson *et al.* (1998) reported two encounters in the RPBR. We have three additional records. ACV & JSA observed an adult soaring over El Subterráneo camp on 17 June 2008. ACV & RJG observed two, also in the upper watershed, in late April 2009.

GREAT GREEN MACAW *Ara ambiguus*

Rare and local in Central America, and considered hypothetical in Honduras by Monroe (1968), who mentioned a sight record from Olancho. *A. ambiguus* was subsequently reported from Honduras by Marcus (1983, 1984) and by Anderson *et al.* (2004), who encountered the species regularly along the lower río Plátano. *A. ambiguus* is considered Endangered by BirdLife International (2009), who note that it is 'now rare in the río Plátano'. We encountered *A. ambiguus*, including groups of up to six, during each of our visits to the upper río Plátano. Systematic surveys to determine the size and extent of the río Plátano population are lacking, but the RPBR might represent an important global stronghold for this species given the pace and extent of forest loss elsewhere on the Caribbean slope of Central America.

CRESTED OWL *Lophostrix cristata*

This widespread species was first reported from Honduras by Monroe (1968) and was subsequently considered rare in the country (Bonta & Anderson 2002). On 6 July 2007 and 13–15 January 2008, RJG recorded *L. cristata* by voice near Las Marías in the RPBR.

SHORT-TAILED NIGHTHAWK *Lurocalis semitorquatus*

This widespread species was first recorded in Honduras in 1988 (Howell & Webb 1992) and has been considered rare in the country (Bonta & Anderson 2002). On 9 February 2009, RJG observed one at dusk in the upper drainage of the río Plátano at Pomokir camp. Next day, RJG observed two at dusk downriver of Pomokir camp.

GREY-RUMPED SWIFT *Chaetura cinereiventris*

This widespread species was thought likely to occur in eastern Honduras by both Marcus (1983) and Anderson *et al.* (2004), but has not previously been reported north of Nicaragua (AOU 1998, Chantler 1999). The northernmost previous record was a specimen taken by T. R. Howell 18 km north-east of Siuna, in the Región Autónoma del Atlántico Norte, Nicaragua, on 26 June 1954 (University of California Los Angeles, Dickey Collection 35031). We found *C. cinereiventris* common and conspicuous in the upper drainage of the Río Plátano, with flocks of 10–25 observed on most days during most visits to the area. We distinguished *C. cinereiventris* from the locally less common Vaux's Swift *C. vauxi* by the cool grey rump contrasting strongly with the darker mantle. This is the first record of *C. cinereiventris* for Honduras, and represents a northward range extension of >200 km.

SNOWCAP *Microchera albocoronata*

Scarce and local, Snowcap is endemic to Central America and was first reported from Honduras by Monroe (1968), who detailed sight records from dpto. El Paraíso. Anderson *et al.* (2004) considered it 'likely to occur' in the Honduran Moskitia region. RJG first encountered a single in the RPBR on 14 April 2003. On subsequent visits, we have found it to be fairly common in the upper watershed and, during 9–20 June 2008, we recorded 3–5 daily near El Subterráneo and La Carrizalosa camps. The presence of several moulting immature males during the latter period suggests that mid June might represent the end of the local breeding season. *M. albocoronata* is thought to undertake local or elevational seasonal movements elsewhere in its range (Stiles & Skutch 1989). We did not encounter it in the RPBR during late July / early August 2006. We photographed an immature male near La Cueva camp in June 2008 (Fig. 3).

KEEL-BILLED MOTMOT *Electron carinatum*

This scarce and local species is endemic to the Caribbean slope of Central America, and is considered Vulnerable by BirdLife International (2009). Anderson *et al.* (2004) drew attention to the importance of the Honduran Moskitia as a probable population stronghold for the species. We detected several by voice in the upper drainage of the río Plátano, and photographed one at La Cueva camp on 15 June 2008, which image will be archived at VIREO.

GREAT JACAMAR *Jacamerops aureus*

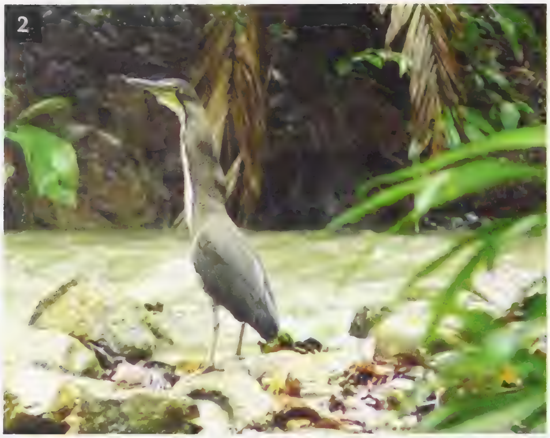
Long thought to range no further north than Costa Rica (AOU 1998), this widespread but scarce species was first reported from Honduras in 2004 (Jones 2004) when RJG videotaped one in the Tawahka-Asangni Reserve, dpto. Gracias a Dios. The first records for Nicaragua were summarised by Múnera-Roldán *et al.* (2006). Following decades of habitat destruction, *J. aureus* is thought to be declining in Central America (e.g. in Costa Rica: Sigel *et al.* 2005). ACV & JSA detected one by voice at La Cueva camp in the upper drainage of the río Plátano on 14 June 2008.

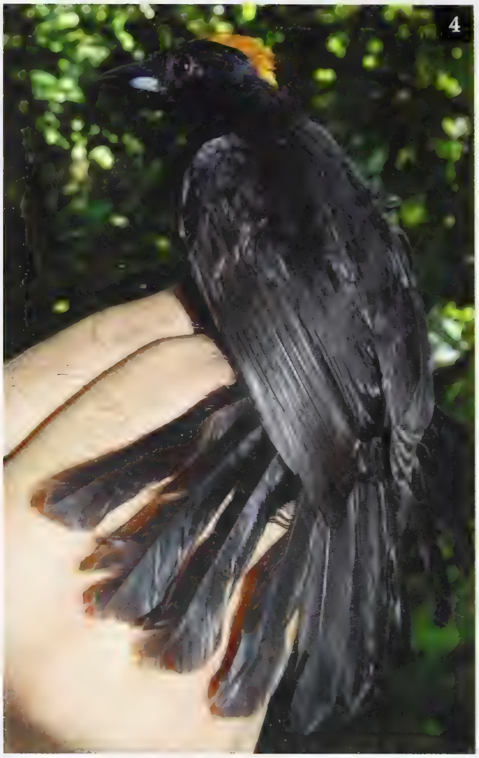
WHITE-FRONTED NUNBIRD *Monasa morphoeus*

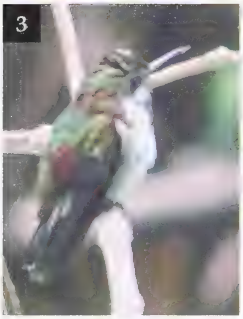
This widespread species reaches its northernmost limit in eastern Honduras (AOU 1998, Rasmussen & Collar 2002). It remains poorly known in Central America and is thought to have declined at several well-studied Caribbean slope sites (e.g. La Selva, Costa Rica: Sigel *et al.* 2005). The persistence of this species in Central America may depend on the survival of large, continuous blocks of lowland forest such as those protected by the RPBR. We have encountered small numbers of *M. morphoeus* in the upper drainage of the río Plátano during each of our visits, including groups of 3–8 individuals.

STRIPED WOODHAUNTER *Hyloctistes subulatus*

Known in north-east Nicaragua from a handful of specimens taken by W. B. Richardson in 1908–09, including the type of *H. s. nicaraguae* (Miller & Griscom 1925), one of two birds obtained at Río Grande, a locality believed to be in dpto. Matagalpa (Lecroy & Sloss 2000). A third specimen of *H. subulatus* was taken by Richardson at 'Peña Blanca', which locality is thought to be in east-central dpto. Jinotega (J. C. Martínez Sánchez pers. comm., but see Anderson 2000). *H. subulatus* has not previously been reported from Honduras, but was regarded as 'likely to occur' in the Honduran Moskitia by Anderson *et al.* (2004) and was also expected by Marcus (1983). ACV & JSA observed one near La Cueva camp on 15 June 2008 as it foraged within an forest interior mixed-species flock. It was seen for *c.*15–20 seconds as it probed in suspended litter and vine tangles in the midstorey. On 23 April 2009, ACV & RJG encountered a single *H. subulatus*, and obtained a sound-recording (deposited at the Macaulay Library of Natural Sounds, Cornell University, Ithaca). The precise locations of W. B. Richardson's localities have proven difficult to determine (Lecroy & Sloss 2000; J. C. Martínez Sánchez pers. comm.). Assuming that 'Peña Blanca' is correctly traced to dpto. Jinotega, our records represent a >200 km northerly range extension. This is the first report of this genus and species from Honduras.







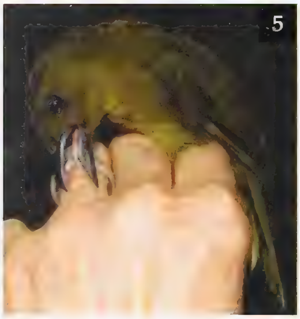


Figure 2. Fasciated Tiger Heron *Tigrisoma fasciatum*, Río Plátano Biosphere Reserve, Honduras, April 2009 (James Adams)

Figure 3. Immature male Snowcap *Microchera albocoronata*, Río Plátano Biosphere Reserve, Honduras, June 2008 (John S. Ascher)

Figure 4. Male Tawny-crested Tanager *Tachyphonus delatrii*, Río Plátano Biosphere Reserve, Honduras, June 2008 (John S. Ascher)

Figure 5. Carmiol's Tanager *Chlorothraupis carmioli*, Río Plátano Biosphere Reserve, Honduras, June 2008 (John S. Ascher)

FASCIATED ANTSHRIKE *Cymbilaimus lineatus*

This species reaches its northernmost limit in eastern Honduras, where specimens are available from Arenal, Olancho (Monroe 1968). *C. lineatus* was considered rare in the Honduran Moskitia by Anderson *et al.* (2004). We saw one on 10 June 2008 at La Carrizalosa camp, and detected another by voice on 15 June 2008 at La Cueva camp.

WING-BANDED ANTBIRD *Myrmornis torquata*

Rare and local in Central America, where it is very infrequently reported away from eastern Panama. *M. torquata* is known in Nicaragua from specimens collected by W. B. Richardson, including several from 'Peña Blanca' (dpto. Jinotega, see above). An additional specimen was collected in Nicaragua in 1922 at Edén, in the Región Autónoma del Atlántico Norte (Huber 1932). Recent sight records from southern Nicaragua were presented by Cody (2000) and Múnera-Roldán *et al.* (2007). In Honduras, *M. torquata* was considered 'likely to occur' in the Moskitia by Marcus (1983) and Anderson *et al.* (2004). JSA observed one in the upper drainage of the río Plátano above La Cueva camp on 14 June 2008. On 25 April 2009, ACV & RJG returned to the same site and photographed a male *M. torquata* (photograph deposited at VIREO) in tall humid forest surrounded by steep slopes and extensive limestone outcrops. These are the first records of the genus and species for Honduras and represent a northward range extension of *c*.200 km from the nearest known locality, Edén, Nicaragua.

GOLDEN-CROWNED SPADEBILL *Platyrinchus coronatus*

Thought to be rare in the Honduran Moskitia by Anderson *et al*. (2004), who listed two specimens from Las Marías. We found *P. coronatus* to be fairly common in the upper drainage of the río Plátano with multiple individuals encountered on most visits to the area.

SPECKLED MOURNER *Laniocera rufescens*

Scarce and local in Central America, and regarded as rare in the Honduran Moskitia by Anderson *et al*. (2004). Monroe (1968) considered it 'exceedingly rare' in Honduras, noting just four specimens from the country. We found *L. rufescens* to be locally fairly common in the upper drainage of the río Plátano near La Carrizalosa, La Cueva and Pomokir camps, with multiple individuals encountered during most visits to the area.

LOVELY COTINGA *Cotinga amabilis*

This Central American Caribbean slope endemic was described as uncommon to locally common in Honduras by Monroe (1968). Following decades of habitat destruction, *C. amabilis* is thought to be declining in Central America (e.g. in Costa Rica: Sigel *et al*. 2005) and is now uncommon to rare and local (Snow 2004). RJG observed an adult male in the upper drainage on 3 April 2003 and ACV observed an adult male at La Cueva camp on 13 June 2008.

SNOWY COTINGA *Carpodectes nitidus*

This scarce cotinga is endemic to the Caribbean slope of Central America. It was first reported from Honduras by Bangs (1903), who collected several near La Ceiba, an area that has since undergone extensive habitat degradation and from where there are no recent reports. *C. nitidus* has declined at several well-studied sites (Sigel *et al*. 2005). We encountered several during each of our visits to the upper río Plátano watershed.

THREE-WATTLED BELLBIRD *Procnias tricarunculatus*

A Central American endemic first reported from the Honduran Moskitia by Anderson *et al*. (2004), who detailed observations made during February–March 1999 along the río Patuca, dpto. Gracias a Dios. *P. tricarunculatus* is considered Vulnerable by BirdLife International (2009) and undertakes complex migrations (Powell & Bjork 2004). These movements, particularly those undertaken by northern populations, remain incompletely understood. RJG heard singing *P. tricarunculatus* on 13 April 2003 in the Waraska Valley (near La Carrizalosa camp). ACV & RJG encountered several singing male bellbirds during late July 2006 in the upper drainage of the río Plátano (in the vicinity of La Cueva camp). We did not detect the species on 8–27 June 2008 or 22 April–2 May 2009, and we tentatively conclude that this highland breeder reaches the RPBR as a seasonal transient, though the precise pattern of its occurrence remains to be fully documented.

SONG WREN *Cyphorhinus phaeocephalus*

First documented in Honduras by a single specimen taken in 1887 along the Segovia River in Gracias a Dios (Monroe 1968), but poorly known in the region. The few recent reports from Honduras include those of Marcus (1983), who encountered it along the río Plátano at

Mairin Tighni camp, and Anderson *et al.* (2004), who regarded the species as fairly common in the Honduran Moskitia. RJG obtained sound-recordings at the Sutawala Valley within the Tawahka-Asangni Biosphere Reserve on 21–22 March 2004 (Gallardo 2008). ACV & JSA identified one by voice above La Carrizalosa camp in the RPBR on 9 June 2008.

STRIPE-BREASTED WREN *Thryothorus thoracicus*

This Central American Caribbean slope endemic reaches its northern limit in eastern Honduras, where it is poorly known. The only previous record in Honduras is from Tawahka-Asangni Biosphere Reserve in 2004 (Jones 2004, Gallardo 2008). One was identified by voice downriver of Las Marías by RJG on 10 July 2007. Another was observed foraging in the lower midstorey with a mixed-species flock at La Cueva camp on 15 June 2008 (ACV & JSA). These records are the northernmost reports of the species.

BLACK-THROATED WREN *Thryothorus atrogularis*

Endemic to the Caribbean slope of Central America and poorly known in Honduras, where first reported by RJG, who obtained a sound-recording in the Tawahka-Asangni Biosphere Reserve, dpto. Gracias a Dios (deposited at the Macaulay Library of Natural Sounds, Cornell University, Ithaca; see Jones 2004). RJG detected one by voice in the upper watershed of the río Plátano above Las Marías on 8 August 2006. This is the second record for Honduras, and the northernmost for the species.

WHITE-THROATED SHRIKE-TANAGER *Lanio leucothorax*

This Central American endemic reaches its northernmost limit in eastern Honduras (AOU 1998), where it was considered rare by Anderson *et al.* (2004). We found *L. leucothorax* to be an uncommon member of mixed-species flocks at forested sites in the upper watershed of the río Plátano drainage, recording small numbers on each of our visits.

TAWNY-CRESTED TANAGER *Tachyphonus delatrii*

First reported from Honduras by Marcus (1983), who encountered it on the Tuskruhuas River in the eastern RPBR. *T. delatrii* was considered rare in the Honduran Moskitia by Anderson *et al.* (2004). We found it common in the forest interior within the upper watershed of the río Plátano drainage. We encountered flocks of 5–10 on most days during each of our visits, and photographed a mist-netted individual in June 2008 (Fig. 4).

CARMIOL'S TANAGER *Chlorothraupis carmioli*

This widespread species was considered rare in the Honduran Moskitia by Anderson *et al.* (2004) who detailed the first records from near Las Marías. We found *C. carmioli* to be a common and conspicuous species at forest interior sites in the upper watershed of the río Plátano drainage. We recorded flocks of 5–10 on most days during each of our visits, and a mist-netted individual was photographed in June 2008 (Fig. 5).

SLATE-COLOURED SEEDEATER *Sporophila schistacea*

This widespread species is rare and irregular in the Central American portion of its range (Ridgely & Gwynne 1989, Stiles & Skutch 1989, Howell & Webb 1995), and was not recorded in Honduras prior to 1979 (Marcus 1983). RJG noted a single on 3 April 2002 near Las Marías. On and around 17 April 2003, RJG found *S. schistacea* to be common in riparian growth along the río Plátano, but we have not encountered the species subsequently.

SLATE-COLOURED GROSBEAK *Saltator grossus*

This species reaches its northern distributional limit in eastern Honduras, and was first reported in the country by Marcus (1983) who encountered it along the Tuskruhuas River in dpto. Gracias a Dios. Regarded as uncommon in the Honduran Moskitia by Bonta & Anderson (2002), we found *S. grossus* fairly common in the upper drainage of the Río Plátano, with several encountered during each of our visits.

YELLOW-CROWNED EUPHONIA *Euphonia luteicapilla*

Endemic to Central America and regarded as hypothetical in Honduras by Monroe (1968), who mentioned sight records from dpto. Olancho. The species is still poorly known in the country, being described as uncommon in eastern Honduras by Bonta & Anderson (2002), following observations of *E. luteicapilla* by RJG east of the RPBR around Wampusirpe, dpto. Gracias a Dios in 2002. RJG closely studied a pair of *E. luteicapilla* along the río Plátano above Las Marías on 9 August 2006.

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Observations on the breeding biology of birds in south-east Ecuador

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Summary.—Despite many years of ornithological exploration in Ecuador, we are still far from understanding avian nesting seasonality at a countrywide level. Similarly, many birds have only one, or very few, published accounts of their breeding. Here we present data on the reproduction of 66 species from south-east Ecuador, gathered opportunistically between 2004 and 2008.

Whilst Freile *et al.* (2006) noted the relative paucity of information published on the birds of mainland Ecuador during the 20th century, recent years have seen a dramatic increase in the amount of published data on the breeding biology of Ecuador's avifauna. In particular, several important works have recently provided information for hundreds of species, often the first available data for Ecuador, from both the north-west (Marín & Carrión 1994, Greeney & Nunnery 2006, Arcos-Torres & Solano-Ugalde 2007, Solano-Ugalde *et al.* 2007) and the north-east (Greeney *et al.* 2004, Greeney & Gelis 2007, 2008). Breeding biology in Ecuador's south-west has also been fairly well documented, and shows well-defined seasonality (Marchant 1959, 1960, Best *et al.* 1993, 1996). Other than a few scattered studies of individual species (e.g., Schulenberg & Gill 1987, Rasmussen *et al.* 1996, Greeney & Rombough 2005, Greeney *et al.* 2007, Juiña *et al.* 2009), however, the south-east has been relatively neglected. Nonetheless, recent reassessments of current knowledge indicate that, despite Greeney *et al.*'s (and others) recent efforts, information is still mostly anecdotal and many species are still undocumented (possibly still more unstudied than studied).

Here we present breeding data for 66 bird species from the area around Tapichalaca Reserve (TBR, 04°30'S, 79°10'W), north of Valladolid, and adjacent to Podocarpus National Park, in south-east Zamora-Chinchipe Province. We gathered records opportunistically during field work in 2003–08, and include records from lower elevations along the Quebrada Honda as well as in the vicinity of the small town of Tapala. Thus, while most of our observations are centred on the TBR, at 2,500 m, we present data from 1,100–2,700 m in this area. For nests where we were able to gather significant amounts of data we describe our observations individually. Otherwise we present breeding records in the following condensed form: species, date, elevation, any incidental notes (nest status). Nest status is indicated by one of the following abbreviations: (B) building; (L) laying, incomplete clutch; (I) incubation; (N) nestling; (F) fledgling; and (AN) active nest of unknown stage.

Species accounts

SPOTTED BARBTAIL *Premnoplex brunnescens*

On 8 October 2004 we found an empty but intact nest at 2,500 m. On 11 October we flushed the adult from the nest, at which time it contained a single all-white egg which measured 22.5 × 17.0 mm and weighed 3.56 g. The nest was 1.4 m above a steep mountain stream and affixed into a dense clump of epiphytes and moss hanging from a large tree. We found a second nest on 9 October 2004, at 2,300 m, at which time it also contained a single all-white egg. The egg measured 23.0 × 17.0 mm. The nest was 2 m up, directly over a stream and built into a shallow depression on a rock face. The first nest faced a compass direction of 125° whilst the second was oriented 215°. Following the pattern described by Greeney (2009), however, the first was oriented directly upstream from the flow of the water and the second was oriented perpendicular to the flow of the water below the nest. This illustrates that this unique, and still unexplained, pattern of nest orientation is not confined to the population studied in north-east Ecuador. We found an additional nest with two nestlings on 13 October 2006 at 2,400 m. All nests showed similar architecture and variation in nest placement as described for this species in north-east Ecuador (Greeney 2008a) and eggs were similar to those described from elsewhere in Ecuador (Marín & Carrión 1994, Greeney & Nunnery 2006, Greeney & Gelis 2007, Greeney 2008b).

SLATE-CROWNED ANTPITTA *Grallaricula nana*

G. Mendoza found a nest with an egg on 28 October 2006 at 2,550 m; the egg hatched on 29 October. We measured and weighed the nestling from 2–10 November (Table 1). We also recorded parental care with a video camera for 16.3 hours on 5–8 November (7–10 days after hatching; 9.2 hours during the morning and 7.1 hours in the afternoon). The nestling was fed at a mean rate of 2.2 feeds / hour, and an average of 0.98 faecal sacs were removed per hour, all of which were eaten by the adults at the nest. The adults vibrated the nest 1.04 times / hour, leaning into the nest and rapidly moving their bill in and out of the lining in a sewing machine-like fashion (rapid probing *sensu* Greeney *et al.* 2008a). The adults delivered 36 food items to the nestling comprising 21 small unidentified items, nine worms (Oligochaeta), three Lepidoptera larvae, two adult beetles (Coleoptera) and one wasp (Hymenoptera). On 13 November we found the decapitated body of the nestling in the nest. The nest, egg, nestling and parental care were similar to previous observations of this species (Greeney & Sornoza 2005, Greeney & Miller 2008), with the exception that faecal sacs were consumed by the adults at the nest, probably because the nestling was younger in the present study.

TABLE 1
Measurements of a nestling Slate-crowned Antpitta *Grallaricula nana* from Tapichalaca, Ecuador. * = not measured.

Days after hatching	Mass (g)	Wing (mm)	Tarsus (mm)
4	8.5	10	13
5	9	11	14
6	10	12	15
7	11.5	12.5	16
8	12.5	14	*
9	12.5	16	18
10	14	16	20
11	15.5	17	21
12	17	19	22

BLACKISH TAPACULO *Scytalopus latrans*

We flushed an adult from a nest on the ground on 19 August 2007 at 2,500 m and felt two eggs were in the nest at this time. We visited the nest every 1–3 days, and observed an adult carrying food to the nest for the first time on 28 August. From 28 August to 7 September we visited the nest every 1–2 days, observing it each visit for 1.5–3.5 hours. Two adults brought food to the nest. Nestling begging calls could be heard for the first time on 2 September. After a 30-minute observation period on 8 September with no activity, we inspected the nest, and found it to be empty and intact. In addition to this nest, we found another with two nestlings on 15 September 2007 at 2,450 m, and observed fledglings on 30 October 2007 at 2,440 m. Our brief observations agree with those of other authors (Skutch 1972, Greeney *et al.* 2005a, Greeney 2008c).

CHUSQUEA TAPACULO *Scytalopus parkeri*

We found a nest on 2 August 2007, at 2,500 m. The nest was built inside a natural earthen cavity next to a stream, 2.5 m up a bank, 4.2 m away from the streambed. On 3 August the nest contained two all-white eggs. We checked the nest contents on 13 and 15 August; both times the nest still contained two eggs. On 17 August both eggs had hatched and we estimated the nestlings to have been *c*.2 days old. We visited the nest every 1–2 days thereafter. During these observations, an adult Lepidoptera, a centipede (Chilopoda) and other unidentified invertebrates were delivered to the nestlings. At times, two adults were present at the nest simultaneously. We last observed the nestlings on 22 August, and by 24 August the nest had been depredated. We found an additional nest with two eggs on 15 November 2006 at 2,600 m. We also observed an adult carrying material to a nest on 25 September 2007 at 2,550 m, found another on this date under construction at 2,400 m, and observed fledglings on 27 February 2007 and 1 November 2007, at 2,500 m and 2,450 m, respectively. These data agree with the scant information published for this poorly known tapaculo (Greeney & Rombough 2005, Greeney 2008c, Greeney & Krabbe 2009).

CINNAMON FLYCATCHER *Pyrrhomias cinnamomea*

On 7 October 2004, at 2,600 m, we found a nest containing two fresh eggs. They measured 18.1× 13.6 and 18.3 × 13.8 mm and weighed 1.63 and 1.66 g, respectively. Both eggs were white, densely spotted red-brown, most heavily at the larger end. On 17 October the nest contained a single nestling weighing 1.38 g, suggesting it had hatched that day. The nest was built in a small, sheltered niche, 2.6 m up on a rock ledge. It was a shallow, unlined cup of dry moss. On 19 October heavy rains caused the collapse of the bank above the nest and it was destroyed. We discovered an additional nest with two eggs on 14 September 2007 at 2,550 m and a third nest with two nestlings on 29 November 2004 at 2,550 m. Both of these nests were also on rock faces and were similar in form to that described above. All nests and eggs were similar to those described by Collins & Ryan (1995) from Venezuela.

WHITE-SIDED FLOWERPIERCER *Diglossa albilatera*

On 14 October 2004, at 2,600 m, we flushed a female from a nest containing two eggs. The eggs were pale blue with cinnamon freckling, heaviest at the larger end. They measured 17.7 × 13.5 and 17.7 × 13.2 mm and weighed 1.70 and 1.60 g, respectively. The nest was a neat cup built into a vine tangle 1.7 m above the ground. It was composed externally of bamboo leaves, petioles and small sticks woven together with moss. The egg cup was lined predominantly with *Usnea* sp. moss mixed sparsely with red-brown tree-fern scales (*Cyathea* sp.) and pale fibres. Externally the nest was 11 cm wide × 7 cm tall with internal measurements of 4 cm diameter × 4 cm deep. When we returned 14 days later the nest was empty. Additionally we saw a pair with a dependent fledgling on 2 November 2004 at 2,600 m. The nest and eggs were similar to those previously described (Sclater & Salvin 1879).

SPECTACLED REDSTART *Myioborus melanocephalus*

We observed an adult carrying nest material on 31 July 2007 and subsequently discovered a nest with two eggs in this area on 16 August 2007. The nest was on a gently sloping hillside *c*.2 m above a trail at 2,500 m. We visited the nest every 1–3 days. Both eggs hatched around 22 August, but on 3 September the nest was empty. The internal chamber of this nest was 8.2 cm high and the internal measurements of the egg cup were 6.5 cm wide × 2.9 cm deep. We found three additional nests with two eggs on 20 September 2006 at 2,500 m, on 31 October 2006 at 2600 m, and 12 October 2007 at 2,400 m. On 31 October 2006, at 2,550 m we found a nest with two nestlings. We discovered another nest under construction at 2,550 m on 26 August 2007 and two additional nests under construction on 18 September 2007 at 2,400 m and 2,500 m. These nests were all similar in placement and architecture to those described by Greeney *et al.* (2008b), who also included nesting data from this area.

BLACK-CRESTED WARBLER *Basileuterus nigrocristatus*
On 6 November 2004 we found a nest with a single egg at 2,650 m. We flushed the adult and noted that the egg was warm but slightly damaged and appeared to be rotting. We visited the nest on subsequent days and always found the egg to be cold, apparently abandoned. The egg was white with red-brown flecking forming a ring at the larger end. It measured 20.5 × 14.6 mm. The nest was globular, domed and built 1.2 m up in a small cavity on a rocky cliff face. It was composed externally of moss mixed sparsely with rootlets and bamboo leaves. The inner cup lining was composed of two portions: an outer portion of tightly compacted dry moss and an inner portion of soft, hair-like reddish tree-fern ramenta (Cyatheaceae). Externally it measured 17 cm wide × 15 cm tall and had a lateral entrance 6 cm wide × 4 cm tall. There was a 12-cm lip of moss and leaves below the opening. Internally, the nest chamber was 8 cm tall with the egg cup measuring 5.5 cm wide × 4.0 cm deep. We also observed this species with dependent fledglings on 27 November 2003 (2,600 m) and on 5 November 2007 (2,600 m).

The nest described here is remarkably different in composition to the only well-described nests of this species (Greeney *et al.* 2005b), which were almost entirely composed of dead, dry bamboo leaves (or grasses), with no well-differentiated lining. Thomas K. Salmon (*in* Sclater & Salvin 1879) also described nests built uniformly of dried materials. Whilst the nests described in Sclater & Salvin (1879) were also tucked into cavities, others (Guerrero 1996, Greeney *et al.* 2005b) have described nests suspended low in vegetation. The identification of the adult seen leaving the nest on our first visit is fairly certain, and it remains to be seen how much variation in nest placement and composition is displayed by this species. Until then, we suggest that this description be used with caution.

RUSSET-CROWNED WARBLER *Basileuterus coronatus*
On 28 October 2004, at 2,600 m, we found a nest with two white eggs with red-brown flecking and speckling. They measured 22.7 × 15.4 and 22.2 × 15.4 mm, and weighed 2.86 and 2.76 g, respectively. We revisited the nest every two days and weighed the eggs on 30 October and 1 November, noting that both were developing. During this period the eggs lost 0.87 and 1.06% of their original mass per day, respectively. On 3 November we found egg shells several metres from the nest, apparently eaten by a predator. The nest was built into a natural niche 0.25 m up on a bank beside a small trail. It was a globular ball of dead leaves and moss with an inner cup of two layers. The first layer was of loosely compacted tree-fern ramenta (*Cyathea* sp.). The second (inner) comprised tightly woven pale fibres and a few tree-fern ramenta. Externally the nest measured 11.5 cm wide × 15.0 cm tall and had a lateral opening which measured 6.5 cm wide × 7.0 cm tall. There was an 8-cm lip of material extending outward below the entrance. The inner chamber was 10 cm tall overall with the egg cup measuring 5.5 cm wide × 3.5 cm deep, internally.

On 30 October 2004 we found a second nest at 2,500 m, which also contained two partially developed eggs similar to those described above, measuring 20.4 × 14.7 and 20.9 × 14.7 mm, and weighing 2.26 and 2.32 g, respectively. We weighed them at this time and again on our second visit on 7 November. The eggs lost mass at a rate of 1.31 and 1.22% / day, respectively. On our final visit on 16 November the nest was empty. The nest was built in a similar situation to the first, 1 m up on a small bank. Externally it was similarly composed of moss and dead leaves but the internal egg cup was slightly different. While still composed of two distinct layers, the first (outer) contained fewer tree-fern ramenta than in the first nest, and included some pale fibres similar to those comprising the entire inner layer of this nest's cup. Externally the nest measured 13 cm wide × 18 cm tall with an internal height of only 8 cm. The cup measured 7 cm in diameter internally and was 4 cm deep. The lateral entrance measured 6 cm wide by only 3 cm tall. There was a 6.5-cm lip of material extending outward below the entrance. Compared to the first nest, it was more completely formed dorsally, while at the first nest the 'roof' was only partially constructed and was instead partially formed in part by the naturally overhanging portion of the cavity in which it was placed. This difference is reflected by the differences in nest opening heights.

On 16 August 2007 we found a nest with two eggs 0.8 m up on a slope above a small trail at 2,500 m. We visited the nest every 1–3 days to check on its contents. Both eggs hatched around 22 August. Between 26 and 27 August, however, the nest was destroyed. On 26 August, while the nest contained two young nestlings, an adult flushed and performed a broken-wing display in front of the observers. The nest cup measured 7.5 cm × 5.1 cm. We found three additional nests, each with two eggs, on 17 September 2006, 14 October, and 14 November 2006, at 2,600 m, 2,350 m and 2,500 m, respectively. We found nests, each with two nestlings, on 3 October 2006 and 31 October 2006, at 2,400 and 2,550 m, respectively. The nests described here are very similar in composition, architecture and placement to those of the only other well-described nest of this species (Greeney *et al.* 2005b).

YELLOW-BILLED CACIQUE *Amblycercus holosericeus*
On 1 December 2003 we found a nest at 2,500 m. It was a deep cup of dead bamboo leaves woven together with a few rootlets and vine tendrils. It was sparsely lined with dark rootlets and was attached on three sides to vertical bamboo shoots, 3.5 m above the ground. Externally the nest measured 13.5 cm in diameter and 9.0 cm tall. The inner portion was 7.5 cm wide × 4.0 cm deep. Adults brought large, single prey items including a katydid (Tetigoniidae) and a large walking stick (Phasmida). Two days after discovery both chicks successfully fledged. Additionally we saw a dependent fledgling on 15 March 2007 at 2,400 m. The nest was similar in placement and construction to the only other described Ecuadorian nest (Greeney *et al.* 2008b), as well as to those described from Costa Rica (Skutch 1954).

Additional records

We also documented the following breeding information: **Bearded Guan** *Penelope barbata*, 26 June 2007, 2,800 m (F), 14 October 2008, 2,600 m (F); **White-eyed Parakeet** *Aratinga leucophthalma*, 29 March 2007, 1,400 m, several pairs entering cavities on cliff face (AN); **Green-fronted Lancebill** *Doryfera ludovicae*, 13 June 2006, 1,750 m, 2 eggs (I); **Amethyst-throated Sunangel** *Heliangelus amethysticollis*, 29 August 2007, 2,500 m, 2 m above ground on the underside of a fern leaf, contained 2 eggs on 9 September (B); Little Sunangel *H. micraster*, 2 November 2006, 2,500 m (F); **Collared Inca** *Coeligena torquata*, 9 August 2005, 2,500 m (F), 29 October 2007, 2,470 m (F); **Crimson-mantled Woodpecker** *Colaptes rivolii*, 8 October 2004, 2,600 m (AN); **Rufous Spinetail** *Synallaxis unirufa*, 1 December 2003, 2,600 m (F), 25 April 2007, 2,500 m (F), 22 August 2007, 2,500 m (B); **Pearled Treerunner** *Margarornis squamiger*, 6 November 2004, 2,500 m (F), 4 November 2006, 2,600 m (F); **Striped Treehunter** *Thripadectes holostictus*, 20 September 2007 (2 AN at 2,300 m and 1 N at 2,150 m); **Olive-backed Woodcreeper** *Xiphorynchus triangularis*, 27 June 2007, 1,800 m (N); **Lined Antshrike** *Thamnophilus tenuepunctatus*, 16 January 2009, 1,400 m (AN); **Long-tailed Antbird** *Drymophila caudata*, 26 November 2004, 2,150 m (F); **Chestnut-naped Antpitta** *Grallaria nuchalis*, 18 October 2007, 2,430 m (F), 31 October 2007, 2,350 m (F);

Rufous Antpitta *G. rufula*, 27 September 2007, 2,650 m (B), 27 September 2007, 2,550 m, 2 eggs (I), 29 October 2007, 2,450 m (F), 4 November 2008, 3,000 m, 2 nestlings (N); **Mottle-backed Elaenia** *Elaenia gigas*, 2 February 2007, 1,100 m (AN); **White-tailed Tyrannulet** *Mecocerculus poecilocercus*, 28 November 2004, 2,300 m (F); **White-banded Tyrannulet** *M. stictopterus*, 27 June 2007, 2,450 m (B); **Rufous-headed Pygmy Tyrant** *Pseudotriccus ruficeps*, 25 February 2007, 2,450 m (F), 26 February 2007, 2,700 m (F), 16 January 2009, 2,600 m (F); **Streak-necked Flycatcher** *Mionectes striaticollis*, 23 April 2007, 2,400 m (F); **Rufous-breasted Flycatcher** *Leptopogon rufipectus*, 26 November 2004, 2,200 m, 2 nestlings (N); **Black-throated Tody-Tyrant** *Hemitriccus granadensis*, 5 November 2007, 2,470 m (F); **Rufous-crowned Tody-Flycatcher** *Poecilotriccus ruficeps*, 9 October 2004, 2,280 m, 3 m up on tip of bamboo shoot (B), 27 July 2007, 2,500 m (B), 2 August 2007, 2,500 m (B); **Common Tody-Flycatcher** *Todirostrum cinereum*, 9 October 2006, 1,600 m (B); **Orange-banded Flycatcher** *Myiophobus lintoni*, 6 April 2006, 2,550 m (F), 26 October 2006, 2,550 m (F), 2 November 2006, 2,550 m (F); **Bran-coloured Flycatcher** *M. fasciatus*, 6 April 2006, 1,150 m (B); **Black Phoebe** *Sayornis nigricans*, 9 October 2004, 1,800 m, 2 nestlings, 3.5 m up (N); **Yellow-bellied Chat-Tyrant** *Ochthoeca diadema*, 13 October 2006, 2,700 m, 2 eggs (I); **Rufous-breasted Chat-Tyrant** *O. rufipectoralis*, 25 November 2003, 2,600 m (F); **Green-and-black Fruiteater** *Pipreola riefferii*, 23 April 2007, 2,450 m (B), 26 June 2007, 2,400 m (N); **Chestnut-crested Cotinga** *Ampelion rufaxilla*, 10 May 2007, 2,350 m, 2 nestlings (N), 11 May 2007, 2,300 m (AN); **Barred Becard** *Pachyramphus versicolor*, 24 August 2007, 2,450 m (B), 29 October 2006, 2,550 m (F); **Turquoise Jay** *Cyanolyca turcosa*, 2 December 2003, 2,650 m, one adult sitting on nest and fed by second adult, nest 15 m up (AN), 26 October 2007, 2,350 m, 3 adults attending 2 chicks in nest 20 m up over small stream (N); **Blue-and-white Swallow** *Pygochelidon cyanoleuca*, 26 September 2007, 2,550 m (I); **Mountain Wren** *Troglodytes solstitialis*, 26 August 2007, 2,515 m (B); **Plain-tailed Wren** *Thryothorus euophyrs*, 26 November 2003, 2,550 m, 2.5 m up in bamboo thicket (B), 25 October 2006, 2,500 m (B), 4 November 2007, 2,450 m, ball with a side entrance, mostly of bamboo parts, 2.5 m above ground in patch of bamboo, 3 nestlings (N); **Rufous Wren** *Cinnycerthia unirufa*, 13 October 2004, 2,500 m (F), 1 November 2004, 2,550 m (F), 28 November 2004, 2,550 m (F), 7 August 2005, 2,500 m (F), 20 October 2005, 2,550 m (F), 5 November 2007, 2,500 m (F); **Grey-breasted Wood Wren** *Henicorhina leucophrys*, 26 November 2004, 2,200 m (I), 26 November 2004, 2,100 m (N); **Great Thrush** *Turdus fuscater*, 28 June 2007, 2,650 m, 2 nestlings (N); **Black-capped Hemispingus** *Hemispingus atropileus*, 29 November 2003, 2,600 m (F); **Black-eared Hemispingus** *H. melanotis*, 7 October 2006, 2,390 m (F), 23 April 2007, 2,400 m (F), 22 May 2007, 2,400 m (F); **Grass-green Tanager** *Chlorornis riefferii*, 26 November 2003, 2,550 m, adult fed fledgling a small fruit (F); **Buff-breasted Mountain Tanager** *Dubusia taeniata*, 1 December 2003, 2,550 m, prey loading, carrying prey repeatedly to same area, including 2.5-cm-long Saturniidae caterpillar gleaned from bamboo (CF); **Bluish Flowerpiercer** *Diglossa caerulescens*, 4 April 2006, 2,500 m (N); 27 June 2007, 1,800 m (B); **Masked Flowerpiercer** *D. cyanea*, 12 October 2004, 2,550 m (F), 15 August 2005, 2,600 m, 5 m up in epiphyte clump (I), 4 April 2006, 2,450 m, 1 nesting (N), 4 April 2006, 2,500 m (F), 27 June 2007, 2,500 m (B); **Common Bush Tanager** *Chlorospingus ophthalmicus*, 15 October 2006, 2,450 m (B); **Short-billed Bush Tanager** *C. parvirostris*, 26 November 2004, 2,350 m (N); **Fawn-breasted Tanager** *Pipraeidea melanonota*, 24 June 2007, 1,850 m (N); **Flame-faced Tanager** *Tangara parzudakii*, 12 May 2007, 2,250 m (N); **Black-faced Tanager** *Schistochlamys melanopis*, 16 January 2009, 1,100 m (AN); **Citrine Warbler** *Basileuterus luteoviridis*, 26 October 2007, 2,450 m (F); **Rufous-collared Sparrow** *Zonotrichia capensis*, 1 December 2003, 2,500 m (F); **Yellow-browed Sparrow** *Ammodramus aurifrons*, 6 April 2006, 1,200 m (B); **Slaty Finch** *Haplospiza rustica*, 12 August 2005, 2,600 m (2 B), 14 September 2006, 2,450 m (1 I and 1 N), 26 September 2006, 2,650 m (1 B and 1 I); **Chestnut-**

capped Brush Finch *Arremon brunneinucha*, 16 August 2005, 2,650 m (N); **Yellow-breasted Brush Finch** *Atlapetes latinuchus*, 28 November 2003, 2,550 m (F), 26 September 2006, 2,530 m, 2 eggs (I), 26 September 2006 2,550 m, 1 egg (L), 26 October 2006, 2,500 m (F), 24 August 2007, 2,500 m (B), 14 October 2007, 2,450 m (F); **Pale-naped Brush Finch** *A. pallidinucha*, 28 November 2003, 2,650 m (F), 12 August 2005, 2,650 m (B), 9 October 2006, 2,700 m (F).

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First nesting of Northern Crested Caracara *Caracara cheriway* in Belize, Central America

by Ryan Phillips, Philip Balderamos & Daniel Roth

Received 24 August 2009

Northern Crested Caracara *Caracara cheriway* is common throughout most of its range from the extreme southern USA to northern South America, but is rare or absent in much of Guatemala, southern Mexico and Belize (Howell & Webb 1995, Morrison 1996, Ferguson-Lees & Christie 2001). There is one record from Petén, Guatemala, and a few from south-east Guatemala (Eisermann & Avendaño 2007) but none in Quintana Roo, Mexico, in the southernmost Yucatán Peninsula, although there are four records in the state of Yucatán within 15 km of the Quintana Roo border (Chablé-Santos *et al*. 2007; B. MacKinnon pers. comm.). In Belize, there have been nine confirmed records in four districts (Orange Walk, Belize, Cayo and Toledo) but no breeding records (Jones *et al*. 2002, Jones 2005). The nearest known breeding is in the north-west Yucatán Peninsula and the Pacific lowlands of Guatemala, which are both >400 km away (Howell & Webb 1995). Here we present the first nesting record of Northern Crested Caracara in Belize (Jones & Komar 2009).

Results

On 25 April 2008, PB and Rudi Burgos found a stick nest in the crown of a cohune palm *Orbignya cohune* (Arecaceae) containing two nearly fledged *Caracara cheriway* chicks on the Tiger Run Farm, Cayo District, west of Central Farm. The nest tree's diameter at breast height was 42 cm and it was in a large active cattle pasture of *c*.3 km^2. PB examined other cohune palms in close proximity for alternate nests and located a large stick nest in one that was 61 m from the nest tree, suggesting that there might have been a nesting attempt prior to 2008. The active nest was re-checked on 18 May 2008 by PB, but the chicks had fledged and were absent. PB was told by the landowner, Escander Bedran, that the nestlings had fledged one week earlier on *c*.12 May. Considering that incubation in this species lasts *c*.30 days and fledging occurs at *c*.8 weeks (Dickinson & Arnold 1996, Rivera-Rodríguez & Rodríguez-Estrella 1998, Nemeth & Morrison 2002), we estimated that the eggs were laid on *c*.11 February 2008.

On 21 February 2009, DR observed an adult carrying food into the 2008 alternate nest tree, which had evident white wash. At least one nestling was observed wing flapping and stretching, which behaviour indicates imminent fledging in most raptors (Boal 1994). On 25 February 2009, RP observed two adults and a recently fledged juvenile, in very fresh plumage, on a snag 35 m from the 2009 nest tree, and a second fledgling was seen a few days later. It was estimated that the eggs were laid around 2 December 2008.

Direct feeding observations and prey remains found in the vicinity of the nest trees in 2008–09 consisted primarily of unknown snakes, as well as a Cattle Egret *Bubulcus ibis*, an unidentified rat and turtles. It could not be determined if they were preyed upon or scavenged.

Discussion

This breeding range extension of >400 km could be a result of either deforestation, the presence of more field observers in Belize, or the relative lack of field observers in the Yucatán and Petén. Until there are more observers in these areas it is difficult to quantify if the caracara's range is expanding. However, this pair nested in an area converted from lowland broadleaf forest to cattle pasture, suggesting a response to deforestation. Historically, suitable habitat did not exist in Belize as broadleaf forest and savanna covered most of the country, whereas Northern Crested Caracara inhabits drier open country (Morrison 1996). Currently, over 30% of the natural vegetation has been lost creating corridors with other countries and suitable breeding habitat for caracaras (Miller & Miller 1998). However, conversion of forest to rice fields and human settlements could negatively impact nesting, whereas improved pastures, scattered trees and low abundance of cattle would better facilitate breeding (Morrison & Humphrey 2001).

In Belize, there are four distinct corridors surrounded by large tracts of contiguous forest that have been deforested, and all of the confirmed records of caracaras in Belize are from close to these corridors. The four areas are in Toledo District in southern Belize, Cayo District in central Belize, and two in Orange Walk District in northern Belize. Of the latter, one runs from north-west Orange Walk through Blue Creek Village and the other through northern Orange Walk. Historically, these areas consisted of broadleaf forest, but they have been cleared for roads, cattle pastures, rice fields or urbanisation. As deforestation continues, more corridors and habitat will be created for dispersing caracaras. Given the mountain barrier in Guatemala between the Pacific lowlands and Belize, the most plausible source population for Belize is the Yucatán Peninsula.

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We are grateful to the Tiger Run Farm landowners, Escander & Abdala Bedran for permitting access to their land and for providing additional information. We thank Lloyd Kiff, Marta Curti, Steven McGehee, Jack Eitniear and H. Lee Jones for reviewing the manuscript and their useful suggestions. David Anderson, Knut Eisermann, Barbara MacKinnon de Montes and Juan Bautista Chablé Santos provided records outside Belize.

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First nest of Dusky Purpletuft *Iodopleura fusca*, from French Guiana

by Johan Ingels & Alexandre Vinot

Received 11 September 2009

The three species of canopy-dwelling purpletufts *Iodopleura* were long considered part of the Neotropical family Cotingidae (Snow 2004). However, morphological (Prum & Lanyon 1989) and genetic data (Chesser 2004, Barber & Rice 2007, Tello *et al.* 2009) indicate that *Iodopleura* should be placed in the Tityridae. Dusky Purpletuft *I. fusca* is a rare to uncommon endemic of the Guianan Shield, from east and south-east Venezuela and the Guianas to adjacent Brazil north of the Amazon and east of the Rio Negro (Restall *et al.* 2006, Whittaker & Kirwan 2008, Green & Kirwan in prep.). In French Guiana, it is uncommon albeit widespread in the vast forests of the interior, e.g. near Saut Pararé and Petit Saut, around Saül, along the Piste de Saint Élie, at the Pic du Croissant, in the Massif des Emérillons and the Réserve Naturelle des Nouragues (Tostain *et al.* 1992). In 1994–96, *I. fusca* was regularly observed at Saint-Eugène, a field research station of the Muséum National d'Histoire Naturelle (Paris) on the Courcibo River, 30 km south of the Petit Saut hydroelectric dam (O. Claessens pers. comm.). In 2006–09, the species was regularly seen at the Centre de Coopération Internationale en Recherche Agronomique pour le Développement research station at Paracou near Sinnamary, and along the dirt road to the Crique Dardanelles through the Forêt de Petit Saut in the Montagne de Fer (O. Claessens & A. Renaudier pers. comm.). More recently, it has also been observed in the Réserve Naturelle de la Trinité (S. Uriot pers. comm.). However, because of its tiny size and unobtrusive behaviour high in the forest canopy, the species probably often goes undetected.

Recently, Whittaker & Kirwan (2008) published new natural history data for all three *Iodopleura*. They described the nesting of White-browed *I. isabellae* and Buff-throated Purpletufts *I. pipra*, but the nest of Dusky Purpletuft was unknown.

On 27 December 2008, P. Ingremeau, R. Monchâtre and AV observed, and AV photographed, a pair of Dusky Purpletufts in the sparsely foliated canopy of a *c.*20-m high tree at the forest edge, along the Piste de Counamama, a broad dirt road through the Forêt

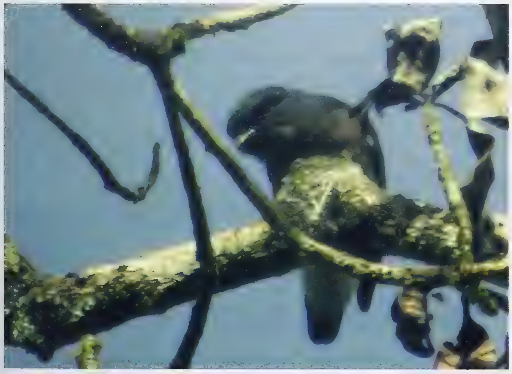

Figure 1. Female Dusky Purpletuft *Iodopleura fusca* constructing its nest, Piste de Counamama, French Guiana (Alexandre Vinot)

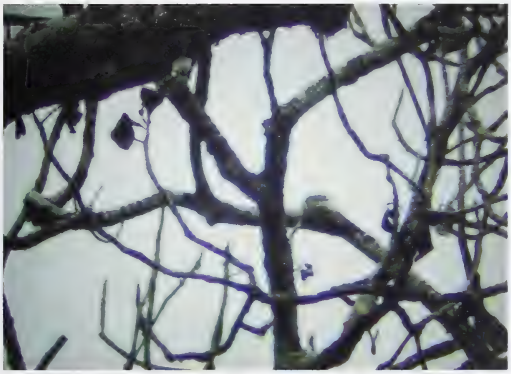

Figure 2. The Dusky Purpletuft *Iodopleura fusca* nest looks very inconspicuous, almost like a bump on the bark of a horizontal, bare branch, on 27 December 2008, Piste de Counamama, French Guiana (Patrick Ingremeau)

de Tamanoir near the Counamama River (05°17′N, 53°17′W). The male (violet pectoral tufts) was quite vocal. On checking the photographs subsequently, JI noted that the female (white pectoral tufts) was constructing a tiny, cone-shaped nest (Fig. 1) on the horizontal part of a bare branch with a diameter of *c*.25–30 mm, in the outer tree crown, a few metres below the top. The nest apparently straddled the branch, where a small knothole was present, and was very inconspicuous, almost like a bump on the bark (Fig. 2). Its top and bottom had estimated diameters of *c*.30 and *c*.45 mm respectively, and its height was *c*.25 mm. When observed, the female was adding what appeared to be a cobweb to the outside of the nest.

On 1 January 2009, the pair was again seen nest building. Apparently the female alone constructed the nest, but was always accompanied by the male. Visiting the nest tree on 19 January 2009, AV thought that the nest was complete. The base appeared slightly broader than three weeks earlier, but no Dusky Purpletufts were seen. On 27 January, AV found that the original nest had disappeared. Bad weather in the first half of January, characterised by heavy rainfall and high winds, might have been the cause. However, the female was starting to build a new nest in exactly the same place and was seen arriving with vegetable matter, which was fixed to a thin pad of material, the base of a new nest. Due to heavy rains in February–March the dirt road became impassable, and the second nest's fate is unknown. However on 1 April, the upper part of the nest tree was broken down.

The small dimensions of the nest cup, with a diameter of *c*.30 mm and a depth <25 mm, are striking compared to the body size of a Dusky Purpletuft, which is *c*.12 cm (Restall *et al.* 2006), but presumably relate to the presumed clutch size of one egg as in other purpletufts (Snow 2004, Whittaker & Kirwan 2008, Green & Kirwan in prep.).

Based on Whittaker & Kirwan (2008) and our observations, we conclude that the nest sites and nests of the three purpletufts are very similar. The nest is constructed on a small horizontal branch, sometimes where it forks or radiates, between *c*.10–30 m high in an open-crowned tree. Spider's web seems to predominate as nest material. However, fresh lichens, fungus fibres and vegetable (seed?) matter are also reported as nesting material. Excrement, sticky mistletoe seeds and probably saliva are used to 'cement' the nest, which recalls that of a hummingbird.

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We thank Olivier Claessens, Alexandre Renaudier, Olivier Tostain and Sylvain Uriot for sending their observations, and Patrick Ingremeau for sharing his photos. Olivier Claessens and Des Jackson commented on drafts of this note. We thank Guy M. Kirwan for constructive comments and editing.

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Volume 130, Number 1, pages 1–72

CONTENTS

Club Announcements 1

KRABBE, N. & RIDGELY, R. S. A new subspecies of Amazilia Hummingbird *Amazilia amazilia* from southern Ecuador 3

ABRAHAMCZYK, S. & KESSLER, M. Ecological and distributional notes on hummingbirds from Bolivian lowland forests 8

DONEGAN, T. M. & AVENDAÑO, J. E. A new subspecies of mountain tanager in the *Anisognathus lacrymosus* complex from the Yariguíes Mountains of Colombia 13

RHEINDT, F. E. New biogeographic records for the avifauna of Taliabu (Sula Islands, Indonesia), with preliminary documentation of two previously undiscovered taxa 33

VALLELY, A. C., GALLARDO, R. J. & ASCHER, J. S. Notes on the birds of the Río Plátano Biosphere Reserve, including four new species for Honduras 52

GREENEY, H. F., JUIÑA J., HARRIS, J. B. C., WICKENS, M. T., WINGER, B., GELIS, R. A., MILLER, E. T. & SOLANO-UGALDE, A. Observations on the breeding biology of birds in south-east Ecuador 61

PHILLIPS, R., BALDERAMOS, P. & ROTH, D. First nesting of Northern Crested Caracara *Caracara cheriway* in Belize, Central America 69

INGELS, J. & VINOT, A. First nest of Dusky Purpletuft *Iodopleura fusca*, from French Guiana 71

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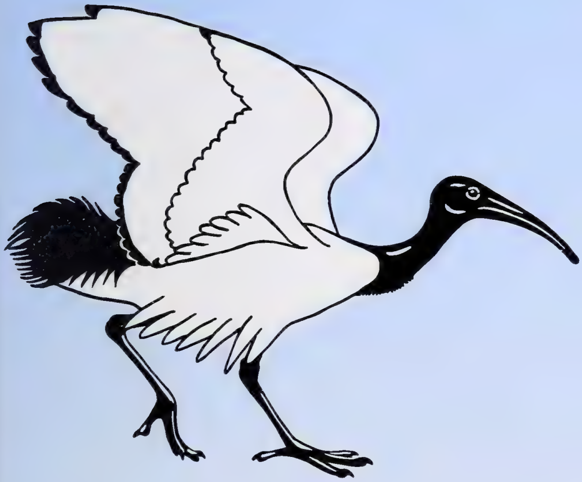

Volume 130 No. 2
June 2010

MEETINGS are normally held in the ground floor of the Sherfield Building of **Imperial College**, South Kensington, London, SW7. This suite is now called the **Tower Rooms** and meetings will normally take place in **Section B** with the entrance opposite the Queen's Tower in the main quadrangle. The nearest Tube station is at South Kensington; a map of the area will be sent to members, on request. (Limited car parking facilities can be reserved [at a special reduced charge of **£5.00**], on prior application to the Hon. Secretary.)

The cash bar is open from **6.15 pm**, and a buffet supper, of two courses followed by coffee, is served at **7.00 pm.** (A vegetarian menu can be arranged if ordered at the time of booking.) Informal talks are given on completion, commencing at about 8.00 pm.

Dinner charges are **£22.50** per person.

FORTHCOMING MEETINGS

See also BOC website: **http://www.boc-online.org**

Please note the minor change to our regular venue (see above). Section B of the renamed Tower Rooms is to the east of the previous venue of the Ante-room which no longer exists; this is nearer to the main entrance off Exhibition Road but still part of the Sherfield Building.

---

22 June—Dr Lincoln Fishpool—*BirdLife International's Important Bird Area programme: a global perspective*
Dr Fishpool coordinates technical aspects of BirdLife's Important Bird Areas (IBA) programme. His talk will present a summary of the global programme through which sites critical for bird conservation worldwide are identified, documented and their protection sought. The talk will highlight recent developments, including the standardised methods by which sites are monitored, the uses to which resulting data are put, progress in identifying marine IBAs and how IBA methodology is contributing to the expansion of the approach to non-avian taxa: Key Biodiversity Areas.

Applications closed on **8 June 2010**

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21 September—Dr Andrew Gosler—*Eggs dressed and undressed*
Dr Gosler (Edward Grey Institute, Oxford University) is well known for the studies he has carried out over many years on the tit populations in Wytham Woods, near Oxford. His talk will provide an overview of recent research he has been conducting into the functional ecology of eggshell pigmentation, which includes novel ideas regarding the selective factors underlying variation in the external appearance of eggs.

Applications to Hon. Secretary (address below) by **7 September 2010**

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2 November—Michael Jennings—*Birds of Arabia*
Details to be announced.

Overseas Members visiting Britain are especially welcome at these meetings, and the Hon. Secretary would be very pleased to hear from anyone who can offer to talk to the Club giving as much advance notice as possible—please contact: S. A. H. (Tony) Statham, Ashlyns Lodge, Chesham Road, Berkhamsted, Herts. HP4 2ST, UK. Tel. +44 (0)1442 876 995 (or e-mail: boc.sec@bou.org.uk).

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Bulletin of the
BRITISH ORNITHOLOGISTS' CLUB

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CLUB ANNOUNCEMENTS

Members are reminded that subscriptions for 2010 were due on 1 January and are kindly asked to check that any Standing Orders with their banks are for the correct amount (£20 p.a.). Regrettably, several members are still paying incorrect subscription rates, causing the Club unnecessary time and expense in administration.

Chairman's message

A flyer asking for a volunteer to take over the role of *Hon. Secretary* was included with the December Bulletin. Unfortunately, no one has come forward and Tony Statham has kindly agreed to continue in post for now. The role could be split between two people, a Meetings Organiser and a Secretary. Because of this and the low attendance at some recent meetings, we are proposing to reduce the number of Club meetings to four, instead of six, in 2011. The number of Committee meetings will also be reduced. In addition, we are investigating the use of Skype at Committee meetings to enable members to participate without travelling to London. This should widen the geographical area from which Committee members can be drawn. Reasonable travel expenses can, in any case, be claimed. In the next year or so the Club will also need a Treasurer. Without a Secretary, Meetings Organiser and Treasurer the Club cannot function, making it imperative that volunteers come forward quickly. I very much welcome offers of help.

Helen Baker
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ANNUAL GENERAL MEETING

The Annual General Meeting of the British Ornithologists' Club was held in the Tower Rooms, Sherfield Building, Imperial College, London SW7, on Tuesday 27 April 2010 at 6.10 pm with Miss H. Baker in the chair. Twelve members were present (including eight from the committee). Apologies were received from Revd. T. W. Gladwin, Mr S. M. S. Gregory, Mr G. M. Kirwan and Dr C. F. Mann.

1. Minutes of the previous meeting. The Minutes of the 2009 AGM held on 29 April 2009, which had been published (*Bull. Brit. Orn. Cl.* 129: 66), were approved and signed by the Chairman.

2. Chairman's report. The Chairman referred members to her review, the Trustees' Annual Report and the Annual Accounts, which were combined in one document available at the meeting. She highlighted the main points of her report, thanking Committee members for their contributions and support over the last year and drawing attention to the difficulty of finding volunteers to take over the key roles.

3. Trustees' Annual Report taken with item 4, the Bulletin, and item 5, Publications report. The *Hon. Secretary*, referring to the Trustees' report, drew attention to the range of papers that had been published in the Bulletin and to the publication of *The birds of Barbados: an annotated checklist*. The *Hon. Treasurer* drew attention to the income and expenditure details, which showed a total of £2,586 excess of income over expenditure. Subscription income and investment income had fallen, but it had been a good year for sales of BOU / BOC Joint Publications. Expenditure for the year of £33,148 was slightly less than in 2008. He proposed the adoption of the Report and Accounts and this was seconded by Mr R. R. Langley.

6. Election of Officers. The Chairman proposed that Mr S. A. H. Statham be re-elected as *Hon. Secretary* and Mr D. J. Montier be re-elected as *Hon. Treasurer*. This was seconded by Cdr. M. B. Casement, RN. No other changes to the Committee were proposed as all other members were eligible to serve at least one more year in office. Ex-officio members are appointed by the Committee.

7. Any Other Business. There was no other business and the meeting closed at 6.35 pm.

The Committee has decided that in future the Chairman's review, Trustees' Annual Report and the Accounts should not appear in the Bulletin. They will be available and retained on the BOC website (www.boc-online.org) and hard copies can be obtained from the *Hon. Treasurer*, D. J. Montier, Eyebrook, Oldfield Road, Bickley, Bromley, Kent, BR1 2LF, UK, e-mail: djmontier@btinternet.com

Members may wish to note that copies of the Minutes of Committee meetings are available on request, once they have been approved.

The Bob Scott Memorial Quiz

Bob Scott, who died last year, was a BOC member for many years. To commemorate his life and to aid trans-Saharan migrants, his wife Ann and friends have launched a quiz that can be downloaded or ordered by post. It covers many areas of natural history and has four excellent prizes. To take part, visit www.birdguides.com and click the 'Donate' button. A hard copy can be obtained from The Bob Scott Appeal, FREEPOST PLUS RLSE-XAJX-UYRY, BirdLife International, Wellbrook Court, Girton, Cambridge CB3 0NA, UK. A minimum donation of £5 is suggested.

David Lack Centenary Symposium, Edward Grey Institute, Oxford

David Lack was arguably the leading figure in the development of modern ornithology in the 20th century, with foundational contributions in many disciplines. On 16 July 2010, the centenary of his birth, an international cast of plenary speakers will review his contribution in key scientific fields and their future development, as well as contributing biographical and personal recollections from those who worked with him. Full information on this event, and the sixth International Hole Nesting Bird Meeting (13–15 July), can be found at: www.zoo.ox.ac.uk/egi/newsevents/2010conferences.html

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Becking's paper on Javan egg collections

A forceful counterpoint to the Becking discussion of Javan egg collections (*Bull. Brit. Orn. Cl.* 129: 18–48) was received from Dr G. F. Mees, disputing the charge of fraud levelled against H. Hoogerwerf and questioning the accuracy of some of the supporting evidence provided by Becking. Following the refereeing process, the *Hon. Editor* and Dr Mees were unable to reach agreement as to the length and wording of his response. With the agreement of Dr Mees, the full correspondence and manuscript have been deposited at Naturalis, Leiden, which institution will, in due course, be conducting its own independent investigation into the claim that parts of the Hoogerwerf collection were fraudulently acquired.—THE HON. EDITOR.

Geographic variation in Socotra Sparrows *Passer insularis*

by Peter G. Ryan, Lisa Nupen, Barrie Rose & Ahmed Saeed Suleiman

Received 3 June 2009

SUMMARY.—Socotra Sparrow *Passer insularis* is the only Socotran endemic landbird that occurs on the other islands of the Socotra archipelago. It is widely reported to occur on Abd 'Al Kuri, but the populations on Samha and Darsa were unknown until very recently. We present genetic data to support a recent call to elevate the Abd 'Al Kuri population to species level, Abd 'Al Kuri Sparrow *P. hemileucus*. Sequence divergence in two mitochondrial genes between *hemileucus* and *insularis* is 1.3–1.7%. The evolutionary history of the sparrows on Socotra cannot be inferred reliably until other taxa in the *P. motitensis* superspecies have been sampled. Sparrows on Samha are not genetically distinct from those on the main island of Socotra, but are appreciably smaller and should be recognised subspecifically. Birds on nearby Darsa were not caught, but photographs suggest they are similar to those on Samha. The Abd 'Al Kuri Sparrow qualifies as Vulnerable, due to its small population (<1,000 mature birds) and limited range (<100 km^2).

The Socotra archipelago off the Horn of Africa consists of Socotra, a large continental island, and several smaller islands. The main island of Socotra is an Endemic Bird Area with at least six endemic landbird species (Stattersfield *et al.* 1998, Kirwan & Grieve 2007). Of these species, only the Socotra Sparrow *Passer* [*motitensis*] *insularis* occurs on other islands in the archipelago: Abd 'Al Kuri, Samha and Darsa (Fig. 1). Until recently, little had been published about geographic variation in sparrows at Socotra. Birds collected on Abd 'Al Kuri, the largest of the satellites, were described as *Passer hemileucus* (Ogilvie-Grant & Forbes 1899), but this has been ignored by most recent authors, who failed to recognise the Abd 'Al Kuri population even as a subspecies (see Kirwan 2008 for a review).

Kirwan (2008) re-examined specimens of the sparrow from Abd 'Al Kuri, and argued that it warrants species status, based on the paler plumage and smaller size. However, he did not consider any genetic markers, nor was he able to assess the status of sparrows on

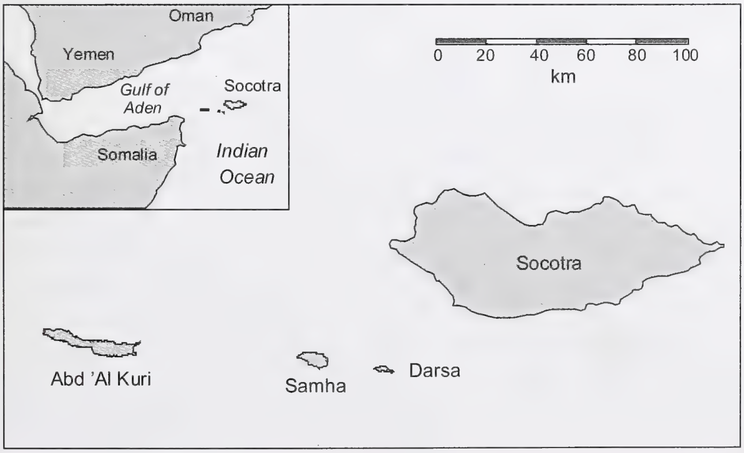


Figure 1. The Socotra archipelago, showing the four main islands and their position relative to the Horn of Africa and the Arabian Peninsula.

the other two islands in the group, Samha and Darsa, where sparrows were not known to occur until recently (Kirwan 2008). In this paper we confirm that Abd 'Al Kuri Sparrows are genetically distinct from those on Socotra, and demonstrate that the sparrows on Samha are appreciably smaller than other Socotra Sparrows. We also suggest that the Abd 'Al Kuri Sparrow qualifies as Vulnerable, due to its small population (<1,000 mature birds) and limited range (<100 km^2).

Materials and Methods

PGR and BR visited Socotra in March–April 2007 as part of a survey of the outer islands (Fig. 1) led by ASS under the aegis of the Socotra Conservation & Development Programme. We spent a week on the main island, two days on Abd 'Al Kuri, two days on Samha and a few hours on Darsa. Sparrows were caught in mist-nets on the northern coastal plain of Socotra (12°36′N, 53°42′E) on 25 March and 4 April, and at a small spring behind the settlement at the west end of Samha (12°10′N, 53°01′E) on 1 April. It was too windy and exposed to catch sparrows using mist-nets in the conventional way on Abd 'Al Kuri, but we managed to trap four individuals by dropping a net over birds feeding on rice at the main settlement (12°11′N, 52°14′E) on 29 March. Only a few sparrows were seen on Darsa. None was trapped during our brief visit ashore on 2 April, but a breeding pair was photographed. Photographs were taken of birds at other locations too, permitting comparison of plumage features identified by Kirwan (2008).

Sparrows caught were measured: flattened wing-chord to the nearest 1 mm, and tarsus, total head, culmen, and bill depth to the nearest 0.1 mm. Juveniles could not be sexed reliably, but other birds were sexed on the basis of plumage characters (see Kirwan 2008). Additional measurements (wing length, tail length, bill length to skull and bill depth) of specimens from Socotra and Abd 'Al Kuri were supplied by G. M. Kirwan (*in litt.* 2007); his measuring protocols are described in Kirwan (2008). A small amount of blood was collected from the brachial vein of a subset of birds and stored in ethanol.

DNA was extracted from this blood with a DNeasy tissue kit (Qiagen) using the animal tissue protocol. Two mitochondrial (mt) DNA target regions were amplified: partial cytochrome-*b* (cyt-*b*, 273 bp) and partial NADH dehydrogenase subunit 3 (ND3, 320 bp) fragments. The primer sequences used for cyt-*b* were GGATTCTCAGTAGACAACCC (523F, forward, Thomassen *et al.* 2003) and GTAGGATGGCGTAGGCGA (827R, reverse, van der Meij *et al.* 2005) and those used for ND3 were GACTTCCAATCTTAAAATCTGG (L10775, forward, Chesser 1999) and GATTTGTTGAGCCGAAATCAAC (H11151, reverse, Chesser 1999).

PCRs were carried out on a GeneAmp PCR System 2700 (Applied Biosystems) and comprised an initial denaturation step at 94°C for three minutes, followed by 35 cycles of 94°C for 60 seconds (denaturation), 54°C for 30 seconds (primer annealing) and 72°C for 60 seconds (extension), with a final extension step of 72°C for five minutes. Bands were cut out and gel purified using the Promega Wizard PCR Clean-up Kit (Promega, UK). Cycle sequencing was carried out with the ABI PRISM Big Dye Terminator V3.1 cycle sequencing Ready Reaction Kit (Applied Biosystems). Sequencing was undertaking using BigDye Technology on an ABI PRISM 3100 Genetic Analyser (Applied Biosystems).

Sequences were inspected in BioEdit (Hall 1999) and checked using FinchTV (Geospiza Inc. v. 1.4.0). Any sequence with ambiguous bases or missing data was discarded. Sequences were aligned and edited with BioEdit Sequence Alignment Editor v. 7.0.4.1 (Hall 1999), which includes Clustal W for multiple sequence alignments (Thompson *et al.* 1997). Unique haplotypes were identified and sequence variation between populations was estimated using DnaSP (Rozas *et al.* 2003).

Unweighted Parsimony (MP), maximum likelihood (ML) and Bayesian approaches were used to infer phylogeny from sequence data for each gene region separately and for the combined sequence data. Parsimony-based analyses were conducted in PAUP* 4.0b10 (Swofford 2002), using branch and bound and heuristic searches, tree-bisection-reconnection (TBR) branch swapping, and 1,000 bootstrap replicates to assess nodal support (Felsenstein 1985). Maximum likelihood analyses were conducted using PhyML (Guindon & Gascuel 2003) using a full heuristic search with 1,000 random addition replicates and TBR branch-swapping.

Bayesian inference was implemented in MrBayes v3.1.2, using a mixed model (GTR+I+G for each target region). Markov Chain Monte Carlo (MCMC) analyses (chain length = 10 million, trees sampled every 1,000 generations, burn-in set at 10% [1,000 trees] for all MCMC analyses) were repeated four times. MCMC convergence was determined by the standard deviation of split frequencies approaching zero and the PSRF (potential scale reduction factor) reaching 1.0 for all parameters.

Sequence data for outgroup *Passer* spp. were obtained from GenBank. The outgroups used were Cape Sparrow *P. melanurus* (GenBank accession numbers (L77905, AY329468.1), Russet Sparrow *P. rutilans* (AF230912.1), House Sparrow *P. domesticus* (AY030163.1), Eurasian Tree Sparrow *P. montanus* (AY030164.1, EF102488.1, AB159160.1), Saxaul Sparrow *P. ammodendri* (AF230915.1) and Sudan Golden Sparrow *P. luteus* (AF230919). Sequences obtained in this study were deposited with GenBank (accession numbers EU478411–22 for ND3 and EU478423–34 for cyt-*b*).

Results

Twenty sparrows were caught on Socotra, 15 on Samha and four on Abd 'Al Kuri. Restricting the analysis to birds from Socotra, there was no significant difference in mean wing length or bill depth measurements from live birds and those from museum skins (t_{53}=0.20, 0.57, *P*>0.8, 0.5, respectively). A biplot of these characters for the pooled samples revealed very little overlap between populations from each island, with the greatest difference between birds from Socotra and Samha (Fig. 2). Comparison of birds caught on Socotra and Samha during this study confirms the markedly smaller size of birds on Samha in all dimensions (Table 1). Within island populations, males averaged slightly larger than females, but these differences were smaller than the differences between islands. Socotra birds averaged 8–12% larger in all dimensions except bill depth, which was 26% greater for both sexes combined.

Sparrows on Samha resembled Socotra Sparrows more closely than Abd 'Al Kuri Sparrows, they having darker, more saturated plumage (Table 2, Figs. 3–6). Females from Samha and Socotra were quite similar, but Samha males differed from those on Socotra in having small black bibs largely confined to the chin and throat, not extending onto the breast, and in having more extensive whitish tips to the median wing-coverts. They also had less extensive black on the ear-coverts than most Socotra Sparrows, although this feature is variable on Socotra. The birds photographed on Darsa resembled birds from Samha.

Partial cyt-*b* sequences (273 bp) were obtained from 12 sparrows (four from Socotra, five from Samha and three from Abd 'Al Kuri), and partial ND3 sequences (320 bp) from four sparrows from each island. Two haplotypes, differing by three transitions, were found in the partial cyt-*b* sequences, one confined to Abd 'Al Kuri and the other to Socotra and Samha (Table 4). Sequences of ND3 were more variable, with five haplotypes found: four on Socotra, of which one was also found in all birds from Samha, and another haplotype on Abd 'Al Kuri (Table 4). The difference between the Abd 'Al Kuri haplotype and the closest Socotra / Samha haplotype was four transitions. Mean sequence divergence among island

TABLE 1

Mensural differences between Socotra Sparrows *Passer insularis* on Samha and the main island of Socotra (mean ± SD and range; all measurements in mm; excludes juveniles). Significance tested with Mann-Whitney U-tests.

	Socotra	Samha	Significance
Males	*n*=9	*n*=5	
Wing	75.2±1.8 (73–78)	70.2±0.5 (70–71)	U=45, *P*<0.001
Tarsus	21.2±0.5 (20.4–22.2)	19.4±0.2 (19.2–19.8)	U=45, *P*<0.001
Total head	34.5±0.4 (33.9–35.4)	31.5±0.4 (31.1–32.1)	U=45, *P*<0.001
Culmen	14.4±0.5 (13.7–15.1)	13.0±0.4 (12.6–13.6)	U=45, *P*<0.001
Bill depth	9.4±0.2 (9.2–9.7)	7.6±0.1 (7.4–7.7)	U=45, *P*<0.001
Females	*n*=9	*n*=9	
Wing	74.8±1.5 (72–77)	68.4±1.0 (67–70)	U=81, *P*<0.001
Tarsus	21.2±0.7 (20.0–21.8)	19.0±0.3 (18.4–19.4)	U=81, *P*<0.001
Total head	35.2±0.8 (34.0–36.3)	31.7±0.4 (31.2–32.2)	U=81, *P*<0.001
Culmen	14.9±0.6 (14.2–16.2)	13.2±0.3 (12.8–13.6)	U=81, *P*<0.001
Bill depth	9.4±0.2 (9.1–9.7)	7.4±0.1 (7.3–7.5)	U=81, *P*<0.001

TABLE 2

Plumage differences among male sparrows in the Socotra archipelago.

Character	Socotra	Samha	Abd 'Al Kuri
Head-sides	rich chestnut	rich chestnut	sandy rufous
Wing-coverts	rich chestnut	rich chestnut	sandy rufous
Underparts	pale grey	pale grey	sandy buff
Back and rump	grey	grey	sandy grey
Mantle streaking	heavy	moderate	moderate–light
Black on ear-coverts	extensive*	limited	limited
Bib	extends onto breast*	confined to throat	confined to throat

*Some variation; one male on Socotra had a rather narrow black line on its ear-coverts and the bib barely extending onto the breast

populations was limited between Socotra and Samha, but was 1.3–1.7% between these islands and Abd 'Al Kuri (Table 3).

In all phylogenetic analyses of the genetic sequence data (cyt-*b*, ND3 and the combined dataset), birds from the three island populations formed a monophyletic group, with Socotra and Samha clustered together, distinct from birds on Abd 'Al Kuri (Fig. 7). The Abd 'Al Kuri clade had consistently high nodal support (>90% for each gene region separately and for the combined dataset). There was little consistency in the identification of a closest relative among other sparrows for which sequence data are available in GenBank. However, no sequences were available for other members of the *Passer motitensis* superspecies.

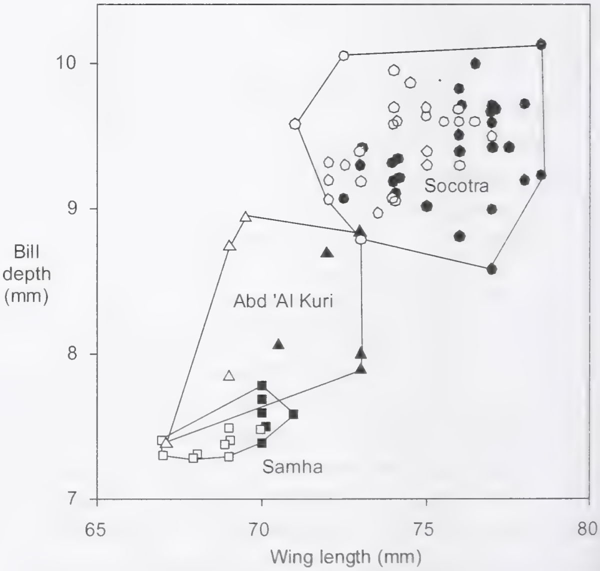


Figure 2. Biplot of wing length versus bill depth in three island populations of Socotra sparrows, based on specimens (G. M. Kirwan *in litt.* 2007) and live birds. Open symbols are females, solid symbols males.

TABLE 3
Genetic divergence (%) between island populations of Socotra sparrows.
Cyt-*b* top right above diagonal, ND3 lower left below diagonal.

Locality	Socotra	Samha	Abd 'Al Kuri
Socotra	–	0.0	1.48
Samha	0.40	–	1.48
Abd 'Al Kuri	1.66	1.26	—

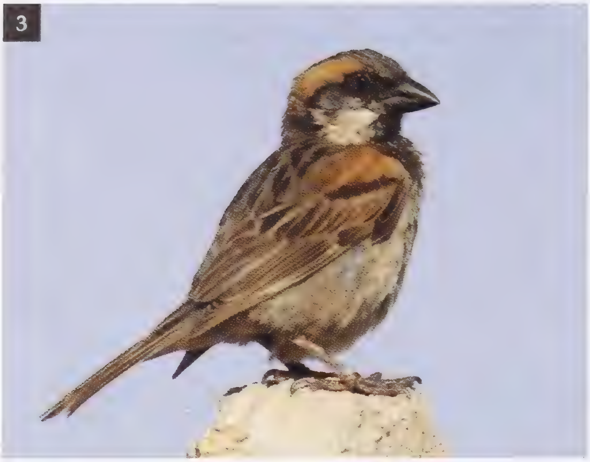
TABLE 4
Haplotype frequencies for island populations of Socotra sparrows.

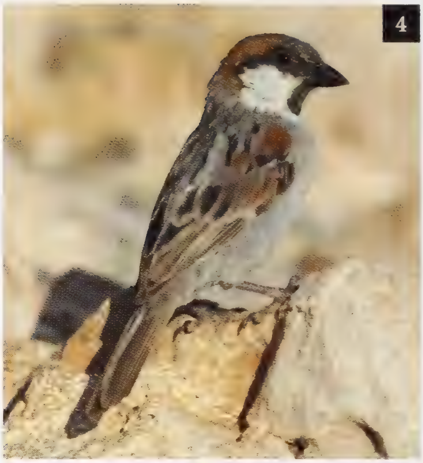
Locality	Socotra	Samha	Abd 'Al Kuri
ND3 Haplotype 1	0	0	4
ND3 Haplotype 2	1	4	0
ND3 Haplotype 3	1	0	0
ND3 Haplotype 4	1	0	0
ND3 Haplotype 5	1	0	0
Cyt-*b* Haplotype 1	0	0	3
Cyt-*b* Haplotype 2	4	5	0

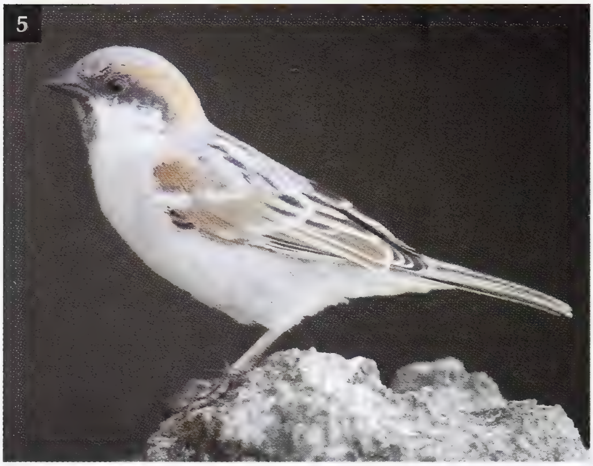
Discussion

Our findings support Kirwan's (2008) call to recognise Abd 'Al Kuri Sparrow *Passer hemileucus* as a species, because it is diagnosably distinct in its plumage and morphology, and shows significant molecular divergence from Socotra Sparrows. Based on a rate of change in cyt-*b* of 2% per one million years (Lovette 2004), sparrows on Abd 'Al Kuri have been isolated from those on Socotra and Samha for around 0.8 million years. However, recent studies have found that substitution rates at the avian cyt-*b* gene vary considerably across lineages, and can be appreciably slower than 2% per million years (Pereira & Baker 2006). Allende *et al.* (2001) estimated a rate of roughly 0.4% per million years for *Passer*, suggesting that sparrows on Abd 'Al-Kuri diverged from those on Socotra / Samha some 3.5 million years ago. We attempted to date this divergence by implementing a relaxed molecular clock (Drummond *et al.* 2006), but without fossil evidence to calibrate the clock, we were unable to obtain acceptable levels of confidence around the nodes of interest. Attempts at constraining the root of the tree using an approximate time for the appearance of the genus *Passer* or geological constraints such as the time of the split of Socotra from mainland Africa proved ineffective at improving confidence (highest posterior density regions). In the absence of sequence data from other taxa in the *motitensis* superspecies, we cannot test whether the two species arose as a result of dispersal / vicariance within the archipelago, or from separate colonisation events, presumably from the Horn of Africa.

The apparent lack of gene flow between birds on Abd 'Al Kuri and the rest of the archipelago is consistent with the greater isolation of Abd 'Al Kuri. It is 63 km from Samha and 105 km from Socotra, whereas Samha and Darsa are only 17 km apart, and 46 and 36 km from Socotra, respectively. Indeed, Abd 'Al Kuri is closer to the African mainland (96 km) than it is to Socotra. Abd 'Al Kuri also has been isolated from the rest of the archipelago for longer than have Samha and Darsa. Socotra split from Africa and Arabia as a result of block faulting during the Tertiary period, probably in association with the formation of the Gulf of Aden some 36MYA (Miller & Morris 2004, Cheung *et al.* 2006). Samha and Darsa formed through erosion of the original Socotra massif; they are separated from the main island by waters <50 m deep, whereas Abd 'Al Kuri is separated from the other islands by a channel >200 m deep (Klaus & Turner 2004). Abd 'Al Kuri exhibits a greater level of species







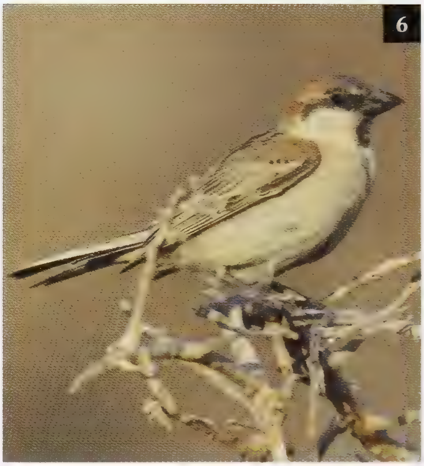


Figure 3. Typical male Socotra Sparrow *Passer insularis*, lowlands of Socotra, late March 2007 (P. G. Ryan)

Figure 4. Typical male Socotra Sparrow *Passer insularis*, Samha, late March 2007 (P. G. Ryan)

Figure 5. Male Socotra Sparrow *Passer insularis*, Darsa, early April 2007 (B. Rose)

Figure 6. Typical male Abd 'Al Kuri Sparrow *Passer hemileucus*, Abd 'Al Kuri, late March 2007 (P. G. Ryan)

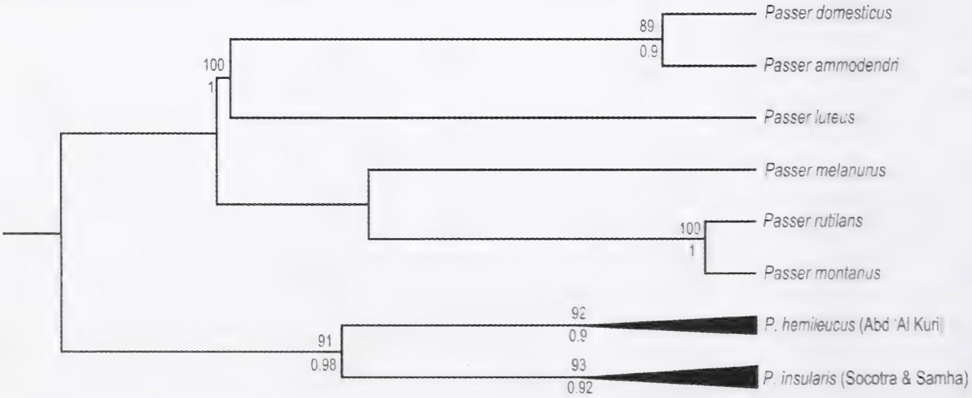

Passer domesticus
89
0.9
Passer ammodendri
100
1
Passer luteus
Passer melanurus
Passer rutilans
100
1
Passer montanus
92
0.9
P. hemileucus (Abd 'Al Kuri)
91
0.98
93
0.92
P. insularis (Socotra & Samha)

Figure 7. Unrooted phylogeny of Socotra sparrows based on the combined partial cytochrome-*b* and NADH subunit 3 sequence data. Values given for nodes are Bayesian posterior probabilities (below node) and maximum parsimony bootstrap support (above node).

endemism among other terrestrial vertebrates (e.g., reptiles, Rösler & Wranik 2004) as well as flowering plants (Miller & Morris 2004), compared to Samha and Darsa.

Despite the limited genetic distance between sparrow populations on Socotra and Samha, the birds on Samha are appreciably smaller, with no overlap in any of the measurements among birds of the same sex (Table 1). Males also differ in several plumage characters (Table 2). The Samha population probably warrants recognition as a distinct taxon, but its formal naming awaits collection of a specimen.

The paucity of genetic diversity within populations on Samha and Abd 'Al Kuri is consistent with the much smaller populations on these islands. Socotra is a large island (3,625 km^2), and the sparrow is the most abundant of the endemic landbirds, with an estimated population in excess of 200,000 birds (Kirwan 2008). There are many fewer sparrows on the other islands, in part due to their smaller size but also their much drier climate, linked to their lower elevation (Miller & Morris 2004, Cheung *et al.* 2006). Abd 'Al Kuri (133 km^2) is the second-largest of the archipelago, but is very hot and dry, with little vegetation over much of the island, and no surface water (Ripley & Bond 1966). Sparrows were fairly common at the main settlement, Khisat Salha, where perhaps 100 scavenged among refuse. At dusk, pairs of adults were observed leaving the settlement along dry drainage lines with scattered shrubs, apparently to roost in taller vegetation in the foothills of the high limestone mountain range that runs along the spine of the island east of Khisat Salha. Several pairs were also found in the better-vegetated wadis running down from these mountains well away from the village. There appears to be little other suitable habitat on the island. During a circumnavigation by small boat the only area we saw with sufficient vegetation to support sparrows was the main mountain chain. Sparrows were absent from the village near the main landing site on the north coast, but ASS has recorded them previously around a small fishing camp at the extreme western end. We estimate a total population of <1,000 mature individuals. The Abd 'Al Kuri Sparrow qualifies as Vulnerable (BirdLife International 2004), due to its small population (criterion D1) and limited range (D2).

Samha (41 km^2) is even smaller than Abd 'Al Kuri, but the island is dominated by a high limestone mountain range that runs virtually the length of the island, with springs at its eastern and western ends. Sparrows were abundant around these springs and at the settlement at the western end. The total population almost certainly is greater than that on Abd 'Al Kuri, but probably <5,000 birds. Darsa is the smallest island (16 km^2) and is uninhabited. Like Samha, it has a limestone mountain running the length of the island. We observed a few sparrows along the southern sea cliffs during a circumnavigation by small boat, and found a pair nesting in a cavity in the roof of a cave on the northern shore. The total population probably is <1,000 birds.

Given considerable interest in the evolution of island birds, it is remarkable that the diversity of sparrows at the Socotra archipelago has been largely ignored (Kirwan 2008). Further studies are required to assess whether the smaller size of sparrows on the outer islands are adaptive (e.g. related to dietary differences or different physiological constraints), or merely a consequence of founder effects and subsequent drift.

Acknowledgements

We thank the members of the Socotra Conservation & Development Programme, especially Paul Scholte, and other participants on the 2007 outer island survey for their assistance and support. Guy Kirwan kindly provided measurements of specimens, and Tony Verboom and Jacqueline Bishop provided help with analyses. Financial support for this project was obtained from the University of Cape Town (UCT). Computing facilities were provided by the AEON (UCT) and laboratory facilities by the Molecular Systematics Lab, Botany Department (UCT).

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How many subspecies of Coal Tit *Periparus ater* are there in Iran?

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SUMMARY.—We discuss subspecific limits in Coal Tit *Periparus ater* in Iran and immediately adjacent regions. Three races are generally accepted as occurring in the country, one of them, *P. a. phaeonotus*, known only from four specimens collected in the Zagros Mountains of south-west Iran. We speculate that the type series of the latter taxon might have been incorrectly labelled as to date, and that the species is only a rare winter visitor to this region of the country. The other subspecies listed as occurring in Iran, *P. a. gaddi* and *P. a. chorassanicus*, are only extremely doubtfully distinct from *phaeonotus*.

Numerous publications testify to the complexity of geographical variation observable in the Coal Tit *Periparus ater* (e.g. Snow 1956, Vaurie 1959, Shirihai & Svensson in prep.), a wide-ranging Palearctic species, from the British Isles east across Eurasia to Kamchatka and Japan, and south to north-west Africa, the northern Middle East, the northern Himalayas and Taiwan (Harrap & Quinn 1996). The most recent treatments recognise either 20 (Harrap & Quinn 1996) or 21 subspecies (Dickinson 2003, Gosler & Clement 2007), subdivided into six groups by several authors, including Harrap & Quinn (1996), although the necessity of recognising all these groups, never mind subspecies, is not always clear, given that most described variation is clinal (Snow 1997, Kirwan *et al.* 2008). The last-named work is the most recent to have discussed racial limits within the so-called 'Caucasus group', whose constituents range from the Crimea of southern Russia to south-west Turkmenistan. Here, we further discuss the subspecific question within Iran.

Three subspecies are generally recognised for the populations in Iran: *Periparus a. phaeonotus* (Blanford, 1873) in the Zagros Mountains of south-west Iran; *P. a. gaddi* Zarudny, 1911, of the Elburz Mountains as far east as Gorgan in the southern Caspian Sea region (and south-east Azerbaijan); and *P. a. chorassanicus* Zarudny & Bilkevitch, 1911, which ranges through Khorasan province, in north-east Iran (and in the neighbouring mountains of south-west Turkmenistan). The first of these is by far the most fascinating of the trio, being known solely from four specimens, among them a syntype held at The Natural History Museum, Tring (BMNH 1874.11.23.35; Fig. 1), which was one of three collected in oak woodland near Shiraz at 1,525–2,135 m (29°37′N, 52°05′E; probably somewhere near Dasht-e Arjan, to the west of the city of Shiraz), by Major Oliver Beauchamp St. John in June 1870, according to the BMNH label. A colour illustration of the taxon by J. G. Keulemans appears in Blanford (1876). The fourth specimen was taken by Zarudny (1905) at the Gamdalkal Pass (31°53′N, 50°32′E), between Dow Polan and Dehdez, Fars province, on 2 January 1904 (modern dating) although the whereabouts of this individual, which is often overlooked in the literature (e.g. by Vaurie 1959, Harrap & Quinn 1996), are presently unknown. Enquiries at the following museums with large holdings of Zarudny's material, Bonn, Moscow, New York, St. Petersburg, Tashkent and Vienna, have failed to locate it. Warren & Harrison (1971) discussed the status of the Tring syntype, which was received on exchange from the Calcutta (formerly Indian) Museum. Both of the other syntypes were also held in Calcutta (Blanford 1876: 1, Sclater 1892: 74), but the latter museum reportedly

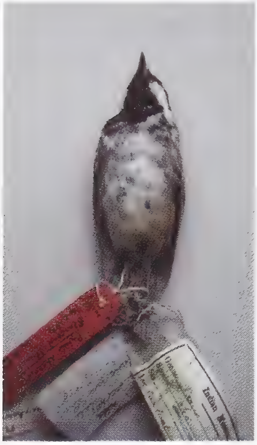
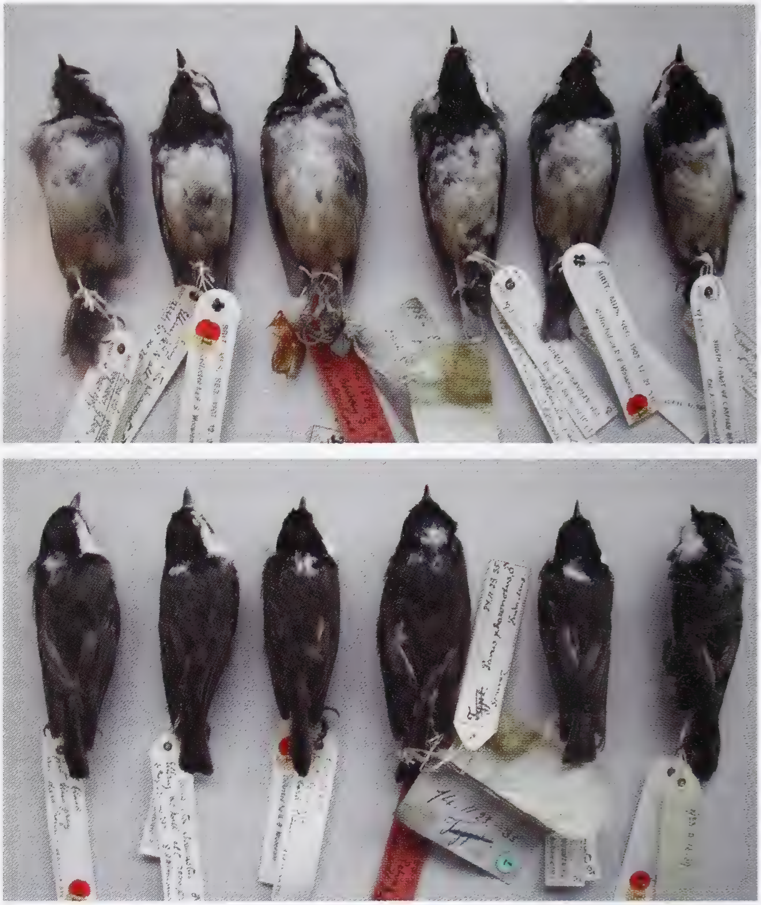


Figure 1. Syntype (BMNH 1874.11.23.35) of Coal Tit *Periparus ater phaeonotus*, collected in 'June' 1870, by Major Oliver Beauchamp St. John, near Shiraz, Iran (Guy M. Kirwan / © Natural History Museum, Tring)



Figures 2–3. Syntype (BMNH 1874.11.23.35) of Coal Tit *Periparus ater phaeonotus* (with red label) flanked by specimens of *P. a. gaddi*, collected in the southern Caspian region of Iran, showing ventral and dorsal surfaces (Guy M. Kirwan / © Natural History Museum, Tring)

no longer has any specimen of *P. ater* from Persia (Iran) (K. Deuti *in litt*. 2009).

Seven years after Zarudny collected his Zagros specimen, Witherby (1910) reported on a handful of specimens of Coal Tit collected by R. B. Woosnam in 1907 in the Elburz and southern Caspian, which he unhesitatingly assigned to *phaeonotus*, despite that Zarudny would, the following year, describe *P. a. gaddi* from the very same region. It is worth remarking that others had already ascribed to *phaeonotus* a much wider range than is currently accepted for this taxon. Thus, Seebohm (1883: 14) claimed that specimens from Lenkoran, Caucasus, could be considered representative of *phaeonotus*, and further stated (with supporting plumage

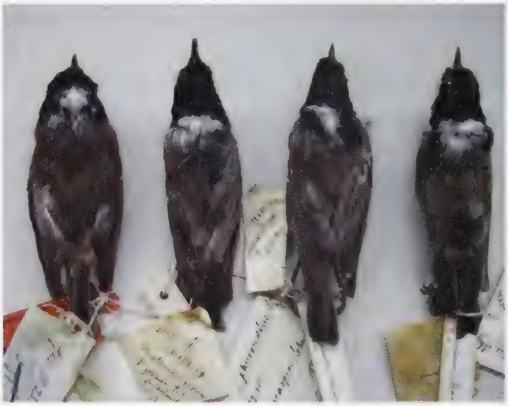


Figure 4. Syntype (BMNH 1874.11.23.35) of Coal Tit *Periparus ater phaeonotus* (at left) with three specimens of *P. a. chorassanicus*, collected in modern-day Turkmenistan, showing dorsal plumage (Guy M. Kirwan / © Natural History Museum, Tring)

detail) under *P. michailovskii* that this taxon 'is an intermediate form between *P. phaeonotus* and *P. ater*; and future researches will probably prove that these two forms are conspecific.' Dresser (1889: 88) also considered two males from Tiflis, Transcaucasia, to be *P. phaeonotus* and remarked that 'a comparison of [*P. michalowskii*] with the type of *P. phaeonotus* in the British Museum convinces me that the two forms cannot possibly be separated, as they are identical in coloration and do not differ in size.' Nonetheless, Hartert (1910: 360–361) upheld *michalowskii* and assigned the Lenkoran specimens (mentioned above) to this taxon. Zarudny (1911), in distinguishing his *gaddi* specimens from his own example of *phaeonotus*, remarked that the former had less extensive brown on the breast-sides and belly, and distinctly paler upperparts. Witherby (1910) already remarked that an error might perhaps have occurred in Blanford's type locality, and he further speculated that the species perhaps does not even occur in south-west Iran. Zarudny's specimen, already mentioned, presumably allayed such concerns, for the question of *phaeonotus* has since abated, although several commentators (e.g. Vaurie 1959, Harrap & Quinn 1996) have drawn attention to the failure of both subsequent collectors (e.g. Koelz) and experienced modern-day field workers, such as Derek Scott and Lindon Cornwallis, to find *P. ater* in the Zagros. As part of our ongoing museum work on Iranian birds, and at the prompting of our colleague K. Kratochwill (*in litt.* 2007), we decided to reinvestigate this issue, especially as it was apparently never truly examined by Vaurie (1957: 20).

We assembled relevant material at BMNH, namely their syntype of *phaeonotus*, eight specimens of *gaddi* and eight specimens of *chorrasanicus*, for study. Figs. 1–4 shows the *phaeonotus* syntype compared to representative material of the other two Iranian subspecies. *P. a. phaeonotus* has almost invariably been considered either to have the brownest upperparts of the entire Caucasus group (Snow 1956, Harrap & Quinn 1996) or at least to be browner or darker than other Transcaucaus and Transcaspian taxa (Vaurie 1959, Gosler & Clement 2007). However, in considering these and other comparisons, including our own, it is vital to recall that virtually all 20th-century and some 19th-century commentators have

TABLE 1

Comparative published and unpublished mensural data for three taxa of Coal Tits *Periparus ater* in Iran; all measurements in mm. Authors' data (all measurements by GMK): wing = max. chord, and bill = to skull.

Source → ↓ Taxon	Authors' data	Snow (1956)	Harrap & Quinn (1996) (*n* = unknown)	Shirihai & Svensson (in prep.)
Periparus ater phaeonotus				
Wing	67 (♂)	-	*c.*67–70 (♂♂)	-
Tail	46 (♂)	-	-	-
Bill	10.83 (♂)	-	-	-
P. a. gaddi				
Wing	66–69 (*n*=5)	67.5–70.0 (3 ♂♂) 64.5–66.0 (4 ♀♀)	65–70 (♂♂) 63–70 (♀♀)	64.5–70.0 (*n*=8)
Tail	44.0–47.5 (*n*=5)	-	-	45–48 (*n*=8)
Bill	10.54–11.98 (*n*=5)	-	-	-
P. a. chorassanicus				
Wing	67.5–69.5 (3 ♂♂) 66.5–67.5 (4 ♀♀)	66–70 (7 ♂♂)	66–70 (♂♂)	-
Tail	45.0–49.5 (3 ♂♂) 46.5–49.5 (4 ♀♀)	-	-	-
Bill	11.22–11.67 (3 ♂♂) 10.57–11.55 (4 ♀♀)	-	-	-

relied on the single *phaeonotus* syntype now in Tring. Harrap & Quinn (1996) considered the upperparts to be slightly more cinnamon-brown than *gaddi*, but such elements are variably present in both *gaddi* and *chorassanicus* (Figs. 2–4). Vaurie (1959) considered *chorassanicus* to be marginally greyer above than *gaddi*, but such distinction is equally not apparent in the Tring material examined by us. Whereas Vaurie (1959) was content to remark that *phaeonotus* was slightly paler below than *gaddi*, Harrap & Quinn (1996) and Gosler & Clement (2007) noted that the paler buff on the flanks reaches to the undertail-coverts; Fig. 2 demonstrates that *gaddi* and *phaeonotus* are very similar in respect of underparts coloration and pattern, and *chorassanicus* is probably indistinguishable from either in these respects. The one difference that might be sufficient to distinguish *chorassanicus* from both *phaeonotus* and *gaddi* is the slightly narrower bill (*cf.* Fig. 4), a character already noted by Snow (1956) and Vaurie (1959) but seemingly ignored by subsequent commentators. Though we did not attempt to quantify this difference, we doubt its significance. (It might also be worth noting that Dementiev & Gladkov 1954 had already elected to synonymize *chorassanicus* with *P. a. michalowskii* (Bogdanov, 1879) of the Caucasus and central and eastern Transcaucasia.) Our own and others' measurements (see, e.g., Snow 1956, Harrap & Quinn 1996; and Table 1) suggest more or less complete overlap between all three Iranian taxa in wing and tail lengths.

That specimens from the Elburz and Zagros Mountains appear more or less identical becomes less surprising when we reconsider the available evidence for the species' presence in the latter range. Given that Coal Tits are capable of performing quite long-range eruptive, latitudinal, and shorter-range altitudinal movements (see, e.g., Gosler & Clement 2007), and vagrants have reached as far afield as Israel (Shirihai 1996), Zarudny's midwinter specimen from the Zagros might easily have been an accidental migrant. St. John's midsummer specimens, however, are harder to explain, except that, as already correctly noted by Witherby (1910), the available syntype BMNH 1874.11.23.35 is in very fresh plumage, which seems most atypical if it was indeed taken in June. Moult in *P. ater* generally commences in late May and can continue until late September or early October (Harrap & Quinn 1996). Given that St. John (a) reported several taxa of principally or exclusively northerly distribution in the Zagros in summer, for instance European Robin *Erithacus. rubecula,* (b) that some of these specimens were brought to him by a native collector, such that (c) it would have therefore been easy for mistakes of dating between the Gregorian and Islamic calendars to have occurred, we suggest that it is difficult to be unequivocal about the dating of the *P. a. phaeonotus* syntype, especially given its plumage state. From the 320 specimens collected by Blanford and St. John received from the India Museum by the British Museum (and now held at Tring), it is obvious that St. John was collecting birds in the environs of Shiraz from at least June to December (pers. obs.). Moult in some of the other Paridae (e.g. a Great Tit *Parus major* and a Sombre Tit *Poecile lugubris*) taken by St. John in this region in June also appears to be well advanced, at least compared to our knowledge of the moulting regimes of these species in Europe (Flegg & Cox 1969, Dhondt 1981, Svensson 1992). This might, of course, merely reflect the different regime of populations in southern Iran. Nonetheless, a mistake in the specimen's date appears to us to require as much elimination as the alternatives, i.e. that *Periparus ater* has, since the early 20th century, become extinct in the Zagros, or that the considerable subsequent field work has failed to locate any breeding population there of an obvious species. If the Zagros birds were all non-breeders, the question arises as to their breeding grounds. Given the syntype's close match for specimens of *gaddi* we consider it likely that its origin was elsewhere in (northern) Iran. Until better evidence becomes available, we recommend that *P. a. phaeonotus* be considered an apparently rare visitor to the Zagros Mountains, and that *P. a. gaddi* be treated as a synonym of *phaeonotus*, whilst *P. a. chorassanicus* is only very doubtfully distinct from other specimens taken elsewhere in northern Iran.

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Assessment of the Anadyr Lowland subspecies of Bar-tailed Godwit *Limosa lapponica anadyrensis*

by Pavel S. Tomkovich

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SUMMARY.—New specimens of breeding Bar-tailed Godwits *Limosa lapponica* in the Zoological Museum of Moscow State University have permitted a revision of the doubtful subspecific status of the isolated population that breeds in the Anadyr River basin, Chukotka, Russia. It is demonstrated that in spite of some intermediate characters between westerly *L.l. menzbieri* and the easterly *L.l. baueri*, birds of the Anadyr population should not be treated as a cline. Birds of this population differ significantly from one or both neighbouring populations in their back pattern, axillaries barring, number of bars on the axillaries, contrast of lines on the underwing-coverts and, in males, absence of a whitish patch on the bent wings formed by the upper greater secondary-coverts. Thus, the Anadyr population should be treated as a separate subspecies, *L.l. anadyrensis* Engelmoer & Roselaar, 1998.

Two new subspecies of Bar-tailed Godwit *Limosa lapponica* were described from Siberia in the late 20th century based on an in-depth analysis of specimens (Engelmoer & Roselaar 1998). In addition to the known East Siberian subspecies *L.l. menzbieri*, it was suggested to recognise *L.l. taymyrensis* and *L.l. anadyrensis* from western and easternmost Siberia, respectively. However, the necessity to name the easternmost Siberian population was subsequently questioned by Tomkovich & Serra (1999) because Engelmoer & Roselaar, (1) included both local and non-breeding specimens in their analyses, the latter from an area known to host godwits of at least two other subspecies (*L.l. menzbieri* and *L.l. baueri*) on migration, and (2) they based their assessment on only a few specimens of known nesting origin. Adding to the confusion is the continued uncertainty as to the geographic provenance of the holotype of *L.l. anadyrensis*. Since Engelmoer & Roselaar (1998), additional specimen records have expanded the known breeding range of godwits on the Anadyr Lowland, Chukotka Autonomous Area, Russia, but more importantly, new specimens of known breeding origin have become available, both from the Anadyr Lowland and Alaska. It is essential to have Alaskan specimens for direct comparisons with birds from Asia. Here I use this new information to reassess the taxonomic status of the population that currently bears the name *L.l. anadyrensis*.

Distribution

The eastern part of the species' breeding range is shown in Fig. 1. The breeding range of the putative *L.l. anadyrensis* population is very restricted and until recently known to encompass only a *c.*250-km-long stretch of the Kanchalan River, Anadyr Lowland (Kistchinski *et al.* 1983). Subsequent records in the first decade of the 21st century have shown godwits breeding or suspected of breeding in additional areas between 63°57′N and 65°50′N and from 174°56′E to 178°41′E (Lappo *et al.* in prep.; E. Koblik & Y. Red'kin pers. comm.). Recently, a godwit thought to be *L.l. baueri* was fitted with a satellite tag in New Zealand and tracked to the Belaya River valley (66°14′N, 173°50′E), a northern tributary of the Anadyr (Gill 2008), suggesting an additional possible breeding site for *L.l. anadyrensis*. Still no signs of breeding Bar-tailed Godwits have been found on the middle Anadyr River,

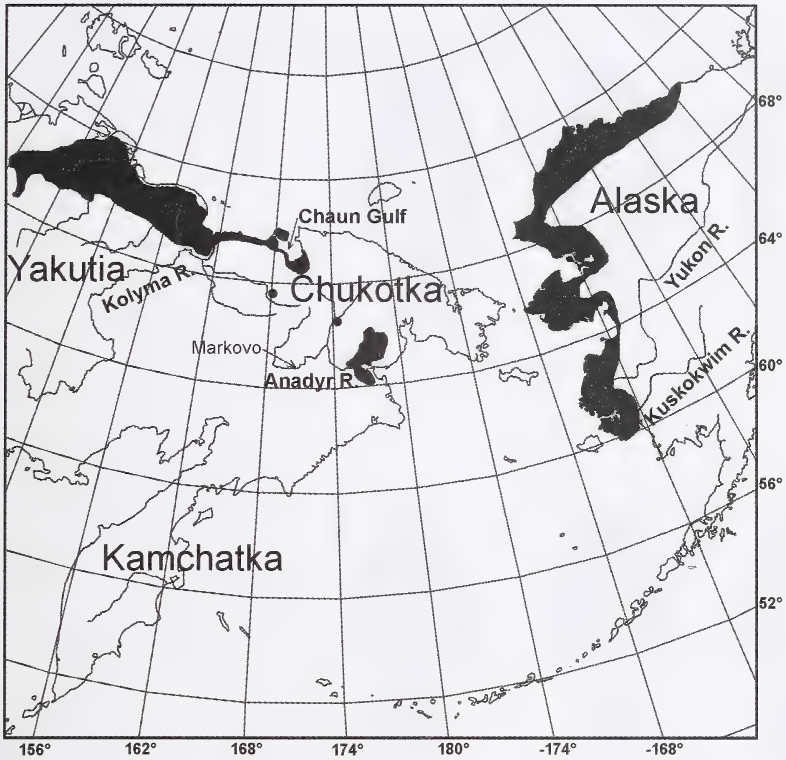

Figure 1. Eastern part of the breeding range of Bar-tailed Godwit *Limosa lapponica* in Siberia after Lappo *et al.* (in prep.) and in Alaska after McCaffery & Gill (2001).

in particular, broadly around Markovo (64°40′N, 170°25′E) (Portenko 1939, Kretchmar *et al.* 1991; A. V. Kondratyev pers. comm., E. Nesterov & I. Karagodin pers. comm.; PST pers. obs.), where the holotype of putative *L.l. anadyrensis* originates (Tomkovich & Serra 1999).

Material and methods

Specimens used in this study included, presumably locally breeding birds (based on their behaviour) from the Anadyr Lowland collected in 2005–06 (*n*=8) and adults guarding young on the Kanchalan River, north-eastern Anadyr Lowland in 1975 (*n*=7). These were compared with breeders from the Yukon-Kuskokwim Delta, Alaska, taken in 1976 (*n*=1) and 2006 (*n*=4), as well as with birds from the Chaun Gulf area, north-west Chukotka (*n*=4) and northern Yakutia (*n*=20) collected in 1912–96. All are housed in the Zoological Museum of Moscow University. Recently, museums have begun preparing skins with one wing detached and spread to facilitate more detailed studies of feathers and moult. In this study all specimens collected post-2000 were prepared accordingly. Unfortunately, no such spread wings are available for *L.l. menzbieri* for comparison with putative *L.l. anadyrensis.*

In this study, I compared specimens of the population breeding on the Anadyr River lowland with neighbouring subspecies (Fig. 1). Bar-tailed Godwits from Alaska have always been recognised as *L.l. baueri*, unlike Siberian birds which are assigned to one or another subspecies (e.g., Portenko 1936, 1939, Engelmoer & Roselaar 1998, McCaffery & Gill 2001, Stepanyan 2003). The population breeding between the Yana and Kolyma rivers, northern Yakutia, Siberia, is definitely considered to be *L.l. menzbieri* according to Portenko

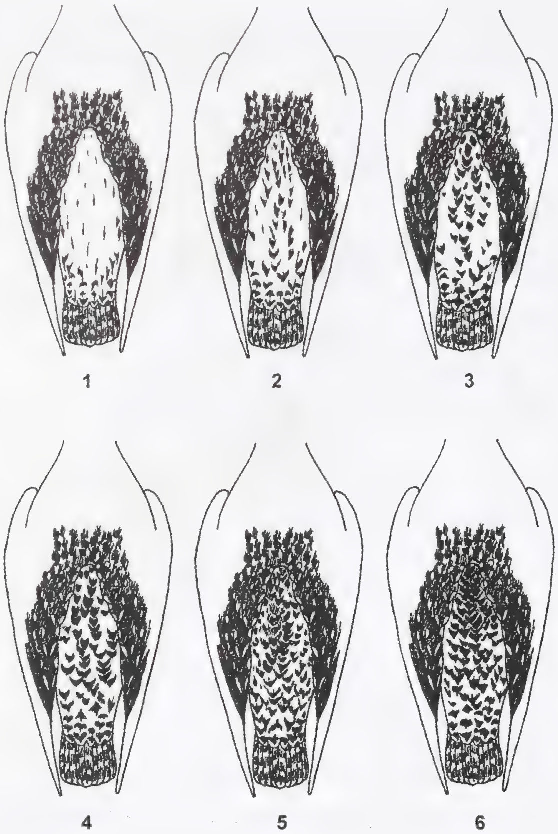

Figure 2. Patterns of back plumage of Siberian and Alaskan Bar-tailed Godwits *Limosa lapponica* used for scoring. Depicted specimens are from the Zoological Museum of Moscow State University: (1) R-114825 from the Yamal Peninsula, West Siberia; (2) R-118470 from the Gydan Peninsula, West Siberia; (3) R-117372 from the Taimyr Peninsula; (4) R-100996 from the Indigirka River, Yakutia; (5) R-120159 from the Anadyr Lowland, Chukotka; and (6) R-123155 from the Yukon-Kuskokwim Delta, Alaska.

(1936) and all subsequent researchers who have recognised this race (e.g., Higgins & Davies 1996, Engelmoer & Roselaar 1998, Stepanyan 2003). The taxonomic status of the population breeding in the Chaun Gulf area, north-west Chukotka, is assigned either to *L.l. menzbieri* (Kistchinski 1988, Engelmoer & Roselaar 1998) or *L.l. baueri* (Stepanyan 2003). From its geographical location, this population may form a transition between *L.l. menzbieri* and the population of the Anadyr Lowland. Therefore the specimens from Chaun Gulf coasts are compared here first before turning to the Anadyr population.

I assessed differences in specimens by measuring the same suite of morphometric variables measured by Engelmoer & Roselaar (1998), namely bill and tarsus length (to 0.1 mm), and length of the wing, secondaries and rectrices (to 1.0 mm). Only wing length was measured differently. Engelmoer & Roselaar (1998) used the maximum length of the wing, i.e. wing maximally straightened and flattened against a ruler. I measured flattened but not straightened wing length on a ruler, because straightening seems to give a much more variable characteristic and it is not always possible to measure straightened wings on skins. Thus, wing length measurements obtained in this study cannot be compared directly with those of Engelmoer & Roselaar (1998).

I also scored the pattern of light and dark barring on the axillaries (after Engelmoer & Roselaar 1998: Fig. 13) and counted the number of dark bars on the outer web of the axillaries. The barring varies on the different axillary feathers; therefore the longest axillary feather on a specimen was used for pattern scoring and counting of dark bars.

Lastly, though Engelmoer & Roselaar found no differences in the degree of whiteness of the uppertail-coverts among stocks of godwits, I nevertheless scored this region and also that of the back using a score of 1–6 (Fig. 2). Plumage of study skins was compared also in other respects, but without a quantitative approach. All measurable differences were compared using Systat (version 7.01, SPSS Inc. 1997) with critical values considered where $P \leq 0.05$.

Results

Only four specimens, all females, of Bar-tailed Godwit are available from the Chaun Gulf, north-west Chukotka, and they are identical (*t*-test & Mann-Whitney test, $P>0.1$)

TABLE 1
Measurements of eastern samples of adult breeding Bar-tailed Godwits *Limosa lapponica* held in the Zoological Museum of Moscow State University. For each population mean ±S.D. (*n*) are given in the upper row and limits in the lower row.

Population	Wing	Bill	Tarsus	Secondary	Tail	Back score	Axillary score	No. of bars on axillaries
				males				
Yakutia-Chaun	210.6±3.8 (8)	85.09±3.41 (7)	52,21±1.61 (9)	87.1±1.9 (9)	68.7±5.6 (9)	4.0 (9)	(9)	8.4 (9)
	208–219	81.4–91.2	49.2–54.3	85–90	55–75	4–5	D, E, G	7–10
Anadyr	217.6±5.7 (10)	82.43±4.21 (10)	53.82±2.28 (10)	89.5±1.84 (10)	71.3±3.9 (10)	5.1 (10)	(10)	9.4 (10)
	210–228	75.0–89.5	50.6–57.6	87–92	66–78	4–6	E, G	8–11
Alaska	227.3±3.8 (4)	84.60±4.16 (4)	56.1±2.43 (4)	91.75±2.21 (4)	70.0±0.8 (4)	6 (4)	(4)	10 (4)
	223–232	80.5–90.4	54.4–59.7	90–95	69–71	6–6	G	10–10
				females				
Yakutia-Chaun	220.0±4.0 (14)	107.46±5.88 (14)	54.84±1.73 (15)	93.4±2.32 (15)	73.3±3.5 (15)	4.1 (15)	(15)	8.1 (15)
	214–228	100.1–119.9	52.1–58.3	90–97	69–79	3–5	E	7–10
Anadyr	224.6±10.1 (5)	101.62±10.7 (5)	56.46±2.98 (5)	94.2±3.11 (5)	73.0±2.9 (5)	5.6 (5)	(5)	9.8 (5)
	213–235	85.8–115.9	53.6–60.2	91–98	70–77	5–6	E, G	9–10
Alaska	240 (1)	113.7 (1)	63.5 (1)	100 (1)	73 (1)	6 (1)	G (1)	9 (1)

in all characteristics to more western female godwits from Yakutia that belong to *L.l. menzbieri*. Comparison of females collected in Chaun and Anadyr revealed that they differ significantly in back score and number of bars on the axillaries (Mann-Whitney test, *P*<0.05). Following these results, samples from Yakutia and Chaun were lumped in further analyses.

Quantitative characteristics of birds of the population breeding on the Anadyr Lowland and neighbouring subspecies are presented in Table 1. Information presented in this table supports the findings of earlier authors that large sexual differences exist in most morphometrics, particularly in the length of the wing, bill, tarsus and secondary feathers. These large size differences between males and females are shown in all three compared populations.

In wing length, tarsus length and secondary feather length, Anadyr males and females are intermediate in average between the other two populations (Table 1), in accordance with their central geographical position, while bill length in both sexes of Anadyr birds is on average smallest and does not differ significantly from either neighbouring population. Analyses of variance revealed a high degree of specificity of Anadyr males in wing length (*P*<0.001), tarsus length (*P*=0.017) and secondary feather length (*P*=0.002), but not in bill length (*P*=0.4). Differences in females do not reach the significant level in any of the morphometrics, possibly partly because of the small Alaskan sample size (one bird). The same result is achieved by discriminant analysis applied to the three most important measurements, wing length, bill length and tarsus length (*P*=0.002 for males; *P*=0.099, n.s. for females).

As to plumage variables under comparison, no significant sexual difference was found within the Yakutia-Chaun and Anadyr populations (Mann-Whitney test, *P*>0.1), but this could not be tested for the Alaskan birds with only one female available. This differed from males in only one of the considered characteristics—it is the only Alaskan specimen at my disposal that has nine not ten dark bars on the longest axillary. This result agrees well with the finding of Engelmoer & Roselaar (1997) concerning absence of sexual differences in scored plumage variables; because of this, sexes were combined for quantitative comparisons of plumage between the populations in this study. The studied plumage characteristics in Bar-tailed Godwits of the Anadyr region are intermediate on the gradient in eastern populations, but they are significantly specific (ANOVA for each: back pattern, axillary pattern and number of bars on the axillary feather, $P<0.001$). The Anadyr population also differs from the two others according to discriminant analysis when all three characteristics are considered ($P<0.001$). However, differences are smaller when comparing only Anadyr and Alaskan birds, being significant only for back pattern (Mann-Whitney test, $P=0.014$).

Two additional plumage characteristics useful for distinguishing the populations were found, but these were not quantified. First, the contrast of dark lines on the underwing-coverts of Bar-tailed Godwits decreases eastward, which difference can be seen best on the greater underwing primary-coverts. Only a few spread wings are available for comparison with none from the Yakutia-Chaun region, making statistical analysis impossible. Second, on folded wings the greater upperwing-coverts in the Anadyr population are of the same general colour as the other wing-coverts, although they often have narrow whitish edges or fringes. Anadyr birds share this character with Yakutia-Chaun birds, but Alaskan males differ markedly: the four birds examined are not uniform grey-brown, but show a slight whitish tinge and broad greyish-white fringes to the greater upperwing-coverts; the only Alaskan female checked does not have these prominent whitish fringes to the wing-coverts. As a result, folded wings of the Yakutia-Chaun and Anadyr population specimens are rather uniformly coloured above, whilst a whitish wing patch is shown by Alaskan males (Fig. 3). This difference in coloration of male wings does not seem to be due to the feathers being

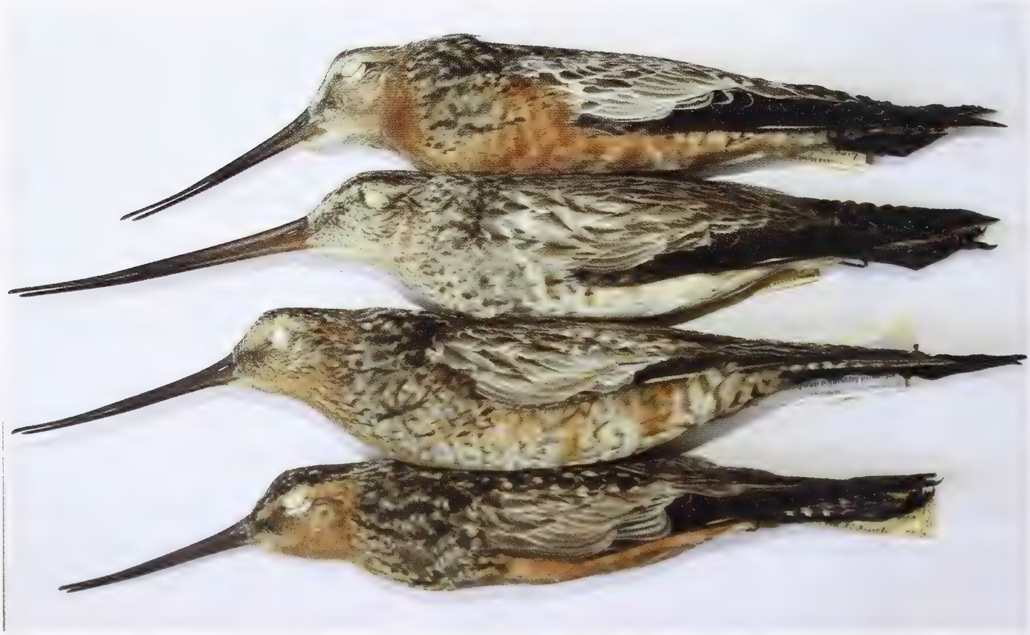

Figure 3. Coloration of the wings in specimens from the Anadyr (two lower birds) and Alaskan (two upper birds) populations of Bar-tailed Godwit *Limosa lapponica*; females two central birds, males upper and lower birds

slightly fresher in specimens collected in Alaska, because no difference is observable when comparing the one Alaskan male taken in July with three others collected in May.

Discussion

Identity of birds from the Chaun Gulf area and north-eastern Yakutia confirms the view of Kistchinski (1988) and Engelmoer & Roselaar (1997) that they belong to *L.l. menzbieri*, for which the type locality is the Indigirka River delta, Yakutia (Portenko 1936).

The above analysis showed that most studied characters of size and scored plumage variables show signs of gradual change west to east, but they nevertheless significantly differ between the eastern populations of Bar-tailed Godwit. Colour contrast on the folded wing of males does not follow this pattern, being present in the Alaskan and absent in both the Anadyr and Yakutia-Chaun populations. Hence Anadyr godwits are distinct in several characters from both westerly Yakutia-Chaun (*L.l. menzbieri*) and easterly Alaska (*L.l. baueri*) birds. Differences in plumage (back pattern, axillary barring pattern, number of bars on the axillary feather, contrast of lines on the underwing-coverts, and uniformity of colour on the bent wing) are responsible for the significant peculiarity of Anadyr birds.

Engelmoer & Roselaar (1997) stated that, in comparison with Alaskan birds, 'secondary lengths are longer' in *L.l. anadyrensis*. The present findings do not support this conclusion. These authors described *L.l. anadyrensis* on the basis of morphometrics (mostly intermediate among eastern races), and they remarked that this population and Alaskan *L.l. baueri* 'share the dark axillaries and upper tail coverts'. These statements differ from the findings of the current study in respect of several plumage characteristics separating eastern populations quite well from each other. It also merits noting that wing length measurements in this study were consistently smaller than those given by Engelmoer & Roselaar (1997), which reflects methods of measuring this parameter and therefore are not surprising.

From the above analysis it is certain that the Anadyr population of Bar-tailed Godwit differs from other populations morphologically, and hence is meritorious of a separate name. As was clearly shown by Engelmoer & Roselaar (1997) on the basis of morphometrics none of the four old names given to non-breeding birds of the southern Pacific can be applied to either of the Bering Sea breeding populations, therefore their name *L.l. anadyrensis* should be used for the Anadyr population. As a result of this study a new diagnosis for *L.l. anadyrensis* can be suggested.

Diagnosis.—Bent wings of males are uniformly coloured similar to westerly *L.l. menzbieri* but unlike easterly *L.l. baueri*, which have a whitish patch formed by the upper greater secondary-coverts (Fig. 3). Measurements of the sexes given in Table 1 (although not significant in females), back pattern (score 5 is most typical), axillary barring pattern (score E or G), number of bars on the longest axillary feather (9 and 10 are typical), are all intermediate between *L.l. menzbieri* and *L.l. baueri*. Contrast of the lines on the underwing-coverts increases in comparison with *L.l. baueri*.

Notes on the holotype.—There are uncertainties as to the origin of the holotype of *L.l. anadyrensis* (Tomkovich & Serra 1999), no. 45871 in the Zoological Institute in St. Petersburg, Russia. The holotype is a female with brood patches, supposedly collected on 3 June 1897 near Markovo, on the middle Anadyr River, where the species is unknown to breed. Information concerning the breeding of Bar-tailed Godwit near Markovo (Marcova) was based on a report by N. P. Sokolnikoff in Allen (1905) and the data originating from Markovo and the Anadyr Gulf area is confusing (Portenko 1939). This fact together with the early date for a female to have developed brood patches and indication of male sex on the specimen label instead of female (real sex is obvious from morphometrics and plumage), all raise doubts about the specimen and / or its label. It was suggested that labels of two specimens, the holotype female and a migrant male Bar-tailed Godwit, delivered to the St. Petersburg Zoological Institute in late 19th century were exchanged at some stage (Tomkovich & Serra 1999).

The very bad condition of the holotype prevented its transportation from St. Petersburg to Moscow for this study. Based on photographs and some additional notes kindly made by Dr V. M. Loskot, it is clear that the specimen fits the description of not only *L.l. anadyrensis* but also *L.l. menzbieri*. It has an appropriate back pattern (score 5, which can be found also in *L.l. menzbieri*) and uniformly coloured bent wing (identical in these two races). Measurements of the specimen (in Engelmoer & Roselaar 1997) fit any of the eastern races, apart from wing length, which is incomparable between this study and that of Engelmoer & Roselaar (1997), but does not accord well with the range of *L.l. menzbieri* females (Wilson *et al.* 2007). It is thus certain that the holotype is not a typical example of *L.l. anadyrensis*. Moreover, doubts persist concerning its original label.

Biology and migration.—No focused study on the breeding ecology, biology and / or migrations of *L.l. anadyrensis* has been undertaken, and no nest has been found. Nevertheless, several facts, related mostly to breeding phenology are available.

Until very recently nothing was known concerning the migration routes and wintering grounds of *L.l. anadyrensis*. However, it was suggested that thousands of godwits on passage in coastal west-central Kamchatka, Russian Far East, during mid May possibly belong to this population (Wilson *et al.* 2007). In 2007, during a study of Bar-tailed Godwits that spend the non-breeding season in New Zealand, one of 15 birds fitted with a satellite transmitter migrated from Golden Bay, New Zealand, to the Yellow Sea and then to the Belaya River valley, a northern tributary of the Anadyr, where the bird spent the entire breeding season (Gill 2008). This male paused en route at the base of Kamchatka Peninsula and arrived at its presumed breeding area on 22 May. Bar-tailed Godwits have been recorded migrating north along the west Kamchatka coast between 10 May (in some years as late as 16 May) and 2 June (Gerasimov & Gerasimov 1998). Observations and / or collection of several migrants near Markovo were made on 27 May–5 June (Portenko 1939), but nothing is known as to their racial identity; Portenko considered all four specimens from that area as *L.l. menzbieri*, not *L.l. baueri*, while he identified both races at the lower Anadyr. An opinion concerning the presence of migrant *L.l. baueri* on eastern Chukotka has been indirectly supported by a USA ring recovery there in spring (Tomkovich 2003).

According to the behaviour of birds in the second to fourth weeks of June, Bar-tailed Godwits on the Anadyr Lowland defend territories, chase avian predators and not very actively mob humans (Y. A. Red'kin pers. comm., N. N. Yakushev pers. comm.; PST pers. obs.), which indicates the incubation period. The only find of downy chicks (4–5 days old) was made on 3 July 1975 and agitated behaviour of other birds in that year was recorded after 30 June (Kistchinski *et al.* 1983), suggesting young hatched in very late June and early July. Recently fledged young accompanied by a group of adults were recorded on 30 July (Kistchinski *et al.* 1983). Not a single *L.l. anadyrensis* has ever been ringed on the breeding grounds. An adult Bar-tailed Godwit bearing a New Zealand ring was shot on 2 October in south-west Kamchatka (Riegen 1999) and a sighting of seven birds with New Zealand colour flags on 12–18 August (Schuckard *et al.* 2006) possibly marks the post-breeding migration route of *L.l. anadyrensis*. On southbound migration Bar-tailed Godwits are more abundant in west Kamchatka than during May. However, large numbers of birds colour-flagged in north-west Australia were seen in west Kamchatka (Schuckard *et al.* 2006), which may mean that *L.l. anadyrensis* and *L.l. menzbieri* mix there, because north-west Australian Bar-tailed Godwits belong to the latter subspecies (Wilson *et al.* 2007). Surprisingly, not a single record of a Bar-tailed Godwit marked in eastern Australia is known from Kamchatka, which might indicate that the non-breeding grounds of *L.l. anadyrensis* are mostly in New Zealand.

It is clear that *L.l. anadyrensis* is currently the least-studied race of Bar-tailed Godwit in the Pacific region and hence its small population should be a priority for research in the near future.

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A review of natal pterylosis of passerines: useful information or avian marginalia?

by Charles T. Collins

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Summary.—Since Wetherbee's (1957) review of passerine natal down patterns, two new neossoptile tracts and a new region of the spinal tract have been identified. Natal down patterns provide limited support for some phylogenetic relationships based on morphological or molecular information. Ecological and geographic correlates noted in natal down patterns need to be revisited when information on more individuals and a greater array of species becomes available. The post-hatching appearance of down-like coverings of nestlings could represent a semiplume portion of the first teleoptile plumage and not natal down.

The first coat of feathers in some but not all young birds has been termed the 'natal down plumage' (Gill 1995). It is made up entirely of filamentous natal down feathers or neossoptiles. These feathers lack a shaft and consist of a tuft of barbs which extrudes on the tip of an incoming typical contour feather of the juvenile (first teleoptile) plumage. As they are fragile feathers, neossoptiles normally last for no more than a few days to a week in passerines before being permanently lost due to abrasion. Some non-passerine chicks have a dense coating of natal down as in waterfowl (Anseriformes) and fowl-like birds (Galliformes). Others, such as woodpeckers (Piciformes), kingfishers and allies (Coraciiformes) are naked at hatching being devoid of any neossoptiles (Gill 1995). In the Apodiformes, newly hatched swifts (Apodidae) are naked whilst treeswifts (Hemiprocnidae) and hummingbirds (Trochilidae) have variable amounts of neossoptiles (Collins 1978). Passerines encompass both extremes with some hatching naked (Skutch 1960, Collins & McDaniel 1989) whilst others have a thick covering of up to several hundred neossoptiles (Wetherbee 1957; CTC unpubl.).

The presence or absence of natal down has been noted, sometimes almost in passing, by many authors describing passerine chicks. In other cases the colour and length of these downs, as well as their distribution on various regions of the body, have been carefully noted (Skutch 1960, 1969, Kovshar & Gavrilov 1974, Gill 1982, 1993, 1994, Gill & Dow 1983, Smith 1985, Greeney & Gelis 2005, Greeney *et al.* 2005). Earlier studies of passerine chicks combined natal down characters (presence or absence of specific neossoptile tracts) with other characters such as mouth colour, tongue spots and size of rictal flanges to assess relationships among closely related species or genera (Neufeldt 1972, and references therein). A new phase in the study of the natal down plumage began with the detailed and quantified study of natal down distribution in North American passerines by D. K. Wetherbee (1957, 1958). This was followed by a similar survey of natal downs in African birds by M. K. Markus (1970, 1972).

My own interest in this topic was sparked by a brief encounter with Wetherbee and a copy of his monograph. I was drawn to some of the gaps in his data, particularly for some familiar family level taxa such as the Thraupidae (now Thraupinae: Burns 1997); this gap was partially closed by data on Scarlet Tanager *Piranga olivacea* presented subsequently (Wetherbee 1958). My first field season with Neotropical birds in Trinidad permitted me to gather some additional information on this diverse group (Collins 1963a). Thereafter, during field studies of swifts in Trinidad and Venezuela, I opportunistically collected specimens of newly hatched passerines and a hummingbird (Rufous-breasted Hermit *Glaucis hirsutus*: Collins 1978). I followed Wetherbee's terminology in describing these specimens, often many years later, as time permitted or when students became interested enough to participate (Collins & Kemp 1976, Collins & Minsky 1982, Minsky & Collins 1983, Wimer & Collins 1994, Collins & Araya 1998, 2002). At this point it would be valid to ask two questions: 'What have we learned' and 'What does it tell us'?

In answer to the first question, we have learned more about the distribution of neossoptiles on passerine birds. Two new neossoptile tracts and additional regions of the spinal tract have been identified. Post-humeral neossoptiles were described for the first time by Ilyashenko (1984) from seven species of Asian passerines. A unique row of cervical tract neossoptiles was described from the Red-capped Cardinal *Paroaria gularis* (Collins & Bender 1977a). A new medial row of unpaired neossoptiles has been recognised in the pelvic region of the spinal tract (Collins & Bender 1977b). A similar medial row of neossoptiles is sometimes found anterior to the mid-dorsal region of the spinal tract and has been termed the inter-scapular region (Collins & Keane 1991, Collins & Araya 1998). There is a need for additional refinements in the description of the complex distribution pattern of the numerous neossoptiles in the capital tract of some Neotropical tyrannid flycatchers (*Elainea* and *Phelpsia*: CTC unpubl.).

What natal pterylosis tells us is less clear. It would seem logical that some informative comparisons of natal down patterns should be possible based on the new information available on additional taxa. This would include the first data on the Neotropical families Furnariidae (Collins *et al*. 1991, Collins & Araya 2002), Conopophagidae (Hilty 1975, Hillman & Hogan 2002), Pipridae (Collins 1982) and Tersinidae (Collins 1973) (although Swallow Tanager *Tersina viridis* is no longer recognised at this level: Sibley & Ahlquist 1990). However, even among the Thraupinae where there have been several studies (Collins 1963a, 1973, Ingels 1979, Levy 1997, Collins & Araya 1998), the natal down distribution of only ten species in eight genera within this large assemblage (235 species in 58 genera: Paynter & Storer 1970) have been examined in detail. In other families, such as the Furnariidae, the number of species for which there is natal down information is equally low. Even so, some ecological trends have been noted. Closed-nest building species frequently possess few or no neossoptiles (Skutch 1960, Collins & McDaniel 1989) and tropical species tend to have fewer neossoptiles than congeneric temperate zone species (Collins & Minsky 1982, Wimer & Collins 1994). However, these trends are based on only a few genera and need to be re-examined when further studies, involving more taxa, become available.

In addition to the low number of species examined, studies of natal pterylosis have generally been characterised by small sample sizes, often only a single brood, and in some cases, only a single individual. Intraspecific variation has been examined only in a few cases (Clark 1967, Collins 1990). This also needs to be given further attention.

A variety of single-character analyses have been utilised to clarify higher level relationships (Beecher 1953, Tordoff 1954, Glenny 1955, Ames 1971, Raikow 1982, 1987, Prum 1990) including some pterolographic studies (Morlion 1980, Clench 1992, 1995). However, recent molecular studies utilising cladistic approaches to phylogeny have proved far more informative in resolving avian lineages and relationships (Burns 1997, Klicka *et al*. 2007). Even so, natal pterylosis data have some utility in supporting conclusions based on behavioural, morphological and molecular characters. One early example was the generic placement of the Dull-coloured Grassquit *Tiaris obscura* in *Tiaris*, as proposed by Schwartz (1972) and Bates (1997), and not among the *Sporophila* seedeaters. *Tiaris* grassquits build globe-shaped nests with a side entrance (Bates 1997, Hilty 2003) and have sparse or no natal down (Goodwin 1959; P. Schwartz pers. comm.). The open-cup nest *Sporophila* seedeaters have a more complete covering of neossoptiles (Collins & Kemp 1976). Natal pterylosis data also support the family level separation of the Thamnophilidae and the Formicariidae (Sibley & Ahlquist 1990). Chicks of 20 species in 14 genera of the Thamnophilidae have all been reported to be naked at hatching (Skutch 1969, Lill & ffrench 1979, Wilkinson & Smith 1997, Cadena *et al.* 2000, Wilson 2000, Christian 2001, Hennessey 2002, Armacost 2004; CTC unpubl.). Chicks of the Formicariidae generally possess a sparse to heavy covering of natal downs, especially in *Grallaria* (but see below); only chicks of *Hylopezus* and *Grallaricula* are naked at hatching (Schwartz 1957, Skutch 1969, Greeney *et al.* 2004).

Neossoptile information can also point to other situations needing further study. One example was the relationship of the Thrush-like Manakin *Schiffornis turdina* to other manakins (Pipridae). Skutch (1969) reported it to have 'copious long brownish grey down, more abundant than that on the nestlings of the majority of passerine birds.' This contrasted with the rather minimal amount of natal down in other piprids (Skutch 1969, Foster 1976, Collins 1982, Christian 2001). Later, based on morphological characters, Snow (1971) noted the genera *Manacus, Pipra* and *Chiroxiphia* formed a well-defined core group in the Pipridae. He also felt that the inclusion of *Schiffornis* was 'especially problematical' and it might best be included in the Tityrinae or Tyrannidae. Thereafter, syrinx morphology (Prum & Lanyon 1989) and DNA hybridisation data indicated *Schiffornis* to cluster with the 'tityra-becard group' of the Tyrannidae (Sibley & Ahlquist 1990). Like *Schiffornis,* some tyrannids possess extensive long natal down (Collins & McDaniel 1989, Collins 1990).

Neossoptiles in passerines are generally considered to be fully developed in both pattern and length at hatching (Wetherbee 1957). However, in a few cases noted by Ilyashenko (1984) it is clear that some neossoptiles, particularly in the post-humeral tract can appear 2–3 days after hatching. This was also noted for alar tract neossoptiles in a single specimen of Palm Tanager *Thraupis palmarum* (Collins & Araya 1998). In other cases, Skutch (1960) reported *Elainea* flycatchers to have a dense coat of what he termed 'secondary down' that erupts 5–7 days after hatching. These downy feathers are not attached to incoming teleoptiles and thus cannot be considered true neossoptiles. In all likelihood they represent an early-appearing semiplume portion of the first teleoptile (juvenile) plumage. This has been reported in Cypseloidine swifts (Collins 1963b) and one passerine, Blue-and-white Swallow *Notiochelidon cyanoleuca* (Arnold *et al.* 1983). Other reports of such secondary coats of natal down in *Erithacus* and *Luscinia* (Cramp 1988) need to be critically re-examined.

Similarly, the occurrence of natal down and other nestling feather coats in antpittas of the genus *Grallaria* needs closer examination. The hatchlings of Scaled Antpitta *G. guatimalensis* are reported to be 'mostly naked with some sparse down' (Dobbs *et al.* 2001) and hatchlings of Scrub Antpitta *G. watkinsi* were 'mostly naked' and 'sparse blackish down was present on most, if not all feather tracts' (Martin & Dobbs 2004). In Pale-billed Antpitta *G. carrikeri* natal down was 'sparse' (Wiedenfeld 1982). However, after 4–5 days post-hatching, chicks of *G. guatimalensis* had 'dark colored down . . . present on all feather tracts except the main element of the ventral tract' (Dobbs *et al.* 2001). The nestling feather coat of 'dense black down' in Rufous Antpitta *G. rufula* (Peyre de Fabriques 1991), 'dark grey down' in White-bellied Antpitta *G. hypoleuca* (Price 2003), 'dense black downy plumage' and 'covered in black down' in Variegated Antpitta *G. varia* (Quintela 1987, Protomastro 2000), and 'dark grey down' in two subspecies of Moustached Antpitta *G. alleni* (Freile & Renjifo 2003) presumably all refer to a later-appearing feather coat in older nestlings and not to the sparse natal down present in hatchlings. Similarly, one Peruvian Antpitta *Grallaricula peruviana* nestling, estimated to be 1–2 days old, was 'bare' but when 13–14 days old was 'covered in a thick red-brown down' (Greeney *et al.* 2004). This later-appearing covering of downy feathers in both *Grallaria* and *Grallaricula* is clearly not natal down which is largely, if not completely, pre-hatching in its development (Wetherbee 1957). In all likelihood it is yet another case of an early-appearing semiplume portion of the incoming juvenile plumage in passerines. How widespread these semiplume feather coats are in passerines and their significance to developing chicks remains to be determined.

The functional significance of natal down remains unclear. As previously reviewed (Wetherbee 1957, and references therein), there are several suggested advantages for these feathers. Among them are (1) the provision of cryptic coloration, (2) protection from the sun's rays, (3) protection from insects, and (4) insulation for the retention of body heat. The absence (= loss?) of natal downs in a variety of closed-nest and cavity-nesting species tends to support some of these suggested functions. However, there are numerous exceptions. A variety of species, as well as the family Thamnophilidae, build open-cup nests and have naked chicks. The reverse is also true with some species that construct enclosed nests having dense coats of natal down (Collins 1990). Again, with additional information for more species on the presence, or absence, of natal downs and their distribution in passerine birds it might prove possible to better understand the adaptive significance of the natal plumage.

Considering the limited information derived thus far from studies of natal pterylosis, choices will have to be made by both field collectors and museum curators as to whether additional material will be collected and made available for future study. In an era of shrinking budgets other material with a higher potential information value, especially DNA, might have to be given priority. Even so, field workers can still make useful contributions to this field of study as shown by the many careful observations made by Skutch (1960, 1969) and others mentioned herein.

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The type and other early specimens of Grey Falcon *Falco hypoleucos*

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Summary.—The origin, identity and current location of the type specimen of Grey Falcon *Falco hypoleucos* and three further specimens known to John Gould, collected in 1839–45, are investigated. The specimen hitherto considered to be the holotype, held at the Academy of Natural Sciences of Philadelphia, is almost certainly not the type but a bird secured by Charles Sturt. The holotype almost surely is missing. The two specimens at Philadelphia are almost certainly those secured by Sturt at Depot Glen. The fourth specimen, collected by John Gilbert in 1842, almost definitely is the only specimen of the species held at the National Museums Liverpool. That specimen was considered missing but was re-found during this work.

After John Gould sold his collection of Australian birds to Dr Thomas B. Wilson of Philadelphia in 1847–48, it was sent to the firm Maison Verreaux, taxidermists in Paris. The consequences were unfortunate for the history of Australian bird collections. Data were lost and some specimens disappeared. Gould's Australian collection numbers over 300 type specimens, thus the transfer has had significant negative consequences for taxonomists studying Australia's avifauna. Historical facts are obscured by ambiguous and inconclusive texts, by contradictory statements, and missing evidence such as letters, lists, specimens and labels. The four Grey Falcon specimens known to Gould in writing *The birds of Australia* (1848b) are affected by these problems. Their origin and fate are investigated here.

Materials and methods

I studied photographs of specimens in collections and compared them with personal observations of wild and captive birds, and researched published and unpublished materials, including notes by John Gilbert. Unpublished printed and reproduced or archived materials are listed as [notes] under 'References'.

Results

The holotype.—At a meeting of the Zoological Society of London on 24 November 1840, John Gould exhibited a specimen of Grey Falcon. The species' description appears on pp. 162–163 of Part 8 of the *Proceedings of the Zoological Society of London*, dated 1840 but published in July 1841 (Zoological Society of London 1893). The description and the specific epithet refer to the specimen's juvenile plumage; underparts white with spatulate black spots, upperparts dark grey, tail grey with obscure brown bars, tipped buff (Marchant & Higgins 1993). Gould did not mention bare-part colours. Measurements are given in Table 1. Gould (1841b) stated that the specimen was the only example available, but in the *Handbook to the birds of Australia* (Gould 1865: 25), he added that he had characterised 'this species by . . . a young female then in my possession'. Morphological differences between the sexes appear to be limited to the reversed sexual size dimorphism typical of many raptors, with no sex-related plumage differences known (Marchant & Higgins 1993).

TABLE 1
Measurements: Gould's type (1840) versus VN 96 / ANSP No. 2099

Note that only Rice measured the specimen according to known procedures and precision.
The precision of Gould's measurements is assumed to be to the nearest eighths of an inch, i.e. ± 1/16".

Gould's type vs. VN 96	Total length	Wing	Tail	Bill	Tarsus
Gould's type (1840)					
inches	17	12 1/2	7 1/2	1 1/4	1 3/4
converted to mm	431.8	317.5	190.5	31.8	44.5
range in mm (i.e. ± 1/16")	430.2–433.4	315.9–319.1	188.9–192.1	30.2–33.3	42.9–46.0
VN 96 / ANSP 2099 (in mm)					
Meyer de Schauensee (1957)	–	326	157	19	49
Fisher	444.5	324	187	31.8	49.2
Rice	–	314.5	166.5	18.8	–

Measurements.—Although it is unknown who took the measurements published in the *Proceedings*, they are assumed to be Gould's. Compared with other species described in part 8 of the *Proceedings*, it appears safe to presume that they were taken to the nearest eighth of an inch, i.e. to a precision of ± 1/16".

Total length is strongly dependent on the method of specimen preparation and is therefore generally disregarded here. Although the bill does not normally change shape after death, there are several different ways to measure length (Baldwin *et al*. 1931, Winker 1998). The resulting differences are considerable. As Gould's methodology is unknown no interpretation is possible. It is unclear how wing length was measured. If it was maximum chord then 12.5 inches lies within the range for juvenile females (Marchant & Higgins 1993), but is above that for juvenile males, given the assumed precision of Gould's measurements. If natural chord was measured, then the maximum chord would be even greater. Tail length is difficult to take accurately because it is not always obvious where the feathers erupt from the skin (R. McGowan pers. comm.). Gould measured this as 7.5 inches (190.5 mm), i.e. considerably greater than the range given by Marchant & Higgins (1993), of 161–170 mm for juvenile females (n=3) and 156–176 mm (n=10) for adult females. Either the type was measured differently or it has indeed such a long tail that the bird is perhaps female, or 7.5 inches is incorrect, or the skin was damaged. Consequently the measurement is disregarded. The length of the tarsometatarsus is given as 1.75 inches (42.9–46.0 mm, if accurate to the nearest eighth of an inch). This range overlaps slightly with males (≤ 43.6 mm, ages combined) and slightly more with females (≥ 44.6 mm, ages combined) (Marchant & Higgins 1993). Consequently, this measurement is inconclusive as to sex.

Winker (1998) pointed out 'a single measurement taken to represent individual size (e.g., wing chord) is not sufficient for careful studies.' He suggested that 'multivariate approaches are preferable'. This, together with the uncertainty over Gould's methodology and his precision, makes a definitive conclusion as to sex on the basis of his measurements impossible. There is a moderate probability, however, that it is a female on wing length.

Collection.—The first information about the type is found on a collection data sheet[1] written by John Gilbert, probably in 1839, just after obtaining the specimen. Gilbert was Gould's principal collector in Western Australia.

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[1] The following was recorded on a collection data sheet by Gilbert, probably in 1839: Falco. Aboriginal name. Gwet"=el=bur (Mountain) Colonial White Falcon. A very rare visitants [sic] in this country. I saw no other specimen in any collection. this [sic] specimen was killed over the Mountain about 60 Miles from the Coast. Presented by Mr L. Burgeß [sic]. Source: 'Papers [microform]: [M725–727], 1835–1876. Mfm M726, No. 1.e'. (University of Cambridge, Department of Zoology.) Australian Joint Copying Project, Canberra.

Lock C. Burgess, 1813–86 (Whittell 1938, Fisher 1992, Sauer 1999), lived near York, east of Perth in Western Australia, where he moved in 1836 (Whittell 1938). Although Gilbert did not expressly state that Burgess collected the specimen, it appears a safe assumption. The specimen was presented to Gilbert in 1839, during his first visit to the Swan River Colony, between 6 March 1839 and 29 January 1840 (Chisholm 1938). Gould (1841b) repeated the information provided by Gilbert, writing that Burgess 'stated that it had been killed over the mountains about sixty miles from the coast.'

It is very likely that Burgess collected the specimen near York, which is on the Avon River, *c.*87 km from Perth or slightly further from the coast, consistent with Gilbert's '60 miles' when travelling overland to the east. It is inland of the Darling Range, consistent with 'over the Mountain'. Gilbert may have met Burgess during a trip inland in June 1839, when Gilbert passed through York on 20 June (Fisher 1992). The precise date is unclear. It was not until September 1839 that Gilbert mentioned 'a Falcon like Gyrfalco' to be one of the latest additions to his collection[2] (Whittell 1941). The specimen was shipped on the *Lord William Bentinck* to England, in 1840[3].

The type locality had been incorrectly assumed by some to be the vicinity of the Moore River, but was clarified by Whittell (1938). G. M. Mathews may have been responsible for this. In his *The birds of Australia* (1915–16), he cited the relevant sentence in Gould with incorrect punctuation: 'The specimen . . . was presented to Mr. Gilbert by Mr. L. Burgess, who stated that he had killed it over the mountains, about sixty miles from Swan River: [*sic*] subsequently it was obtained by Mr. Gilbert himself in the vicinity of Moore's River in Western Australia'. The locality was correctly given by Meyer de Schauensee (1957), Condon (1975) and Debus (*in* del Hoyo *et al.* 1994) as York.

Illustration.—Gould's wife Elizabeth lithographed the specimen. The plate is titled 'FALCO HYPOLEUCUS: *Gould.*', marked 'J&E. Gould del. et lith.', and shows a juvenile. It is the first plate in Part 5 of Gould's *The birds of Australia* (1840–48), published on 1 December 1841. The illustrated bird's plumage matches Gould's (1840) description. Obvious are the white underparts with the prominent spatulate spots typical of juveniles, as are the dark grey upperparts. Unmentioned in the description were the bare-parts colours. As illustrated, the cere is the same yellow as the toes. The bill is mostly pale grey, becoming dark grey to almost black at the tip. The side of the basal lower mandible, i.e. 'below' the cere, is illustrated as being the same yellow as the cere. The orbital ring is pale grey, the adjacent bare skin slightly darker. Noteworthy is that no yellow or orange is shown around the eye. That, together with the upper mandible lacking any yellow, indicates that the type is in its first year. Young Grey Falcons initially lack any yellow or orange around the eye and upper mandible, but acquire such colour later (pers. obs.). I have found no evidence of any notes on the appearance of the plumage and bare parts, neither of the live bird nor of the fresh specimen.

The text to the plate reads: 'Falco hypoleucus [see Name, spelling and citation], Gould. White-breasted Falcon. The only specimen of this genuine and noble Falcon in my collection, or indeed that has ever come under my notice', and continues 'to all appearance, my specimen, which is rather less than a male Jerfalcon, has the adult plumage.' and is followed by a description of the specimen similar to the English text in Gould (1840), again omitting mention of the bare-parts colours. The sex is also not mentioned.

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[2] Gilbert, J. (1839) Letter to John Gould, from Perth, Western Australia, 3 September 1839. In 'Papers of Gregory M. Mathews, 1900–49 [manuscript]. MS 1465, series 24, folder 7'. National Library of Australia, Canberra.

[3] The Burgess specimen was shipped on the *Lord William Bentinck* to England, in 1840. Gilbert's 'List of Specimens sent by [?] . . . to London from Sydney' contains '1 Falco (White)'. Source: Gilbert, John (Australia) 8 ms booklets, c.1841–45.' In 'John Gould (1804–81). Papers and correspondence, Z MSS GOU A and B [microform]: [M2888–2902]. Mfm M2902, No. 10'. Australian Joint Copying Project, Canberra.

Thus, it appears that the type is a juvenile, probably a female on wing measurement, and was collected by Lock Burgess near York, Western Australia, in 1839. It is the holotype being the only specimen available to Gould in describing the species; there are no paratypes.

According to Mathews (1913), 'Gould figures the bird from West Australia beautifully in his Birds of Australia [part 5 of Gould 1840–48]. This plate he afterwards cancelled, and later [part 36 of Gould 1840–48] figured the birds collected by Captain Sturt at the Dêpot, South Australia. Those who, like myself, have the cancelled plate, can see the difference by comparing the two.' In that final part 36 (Gould 1848a), a new plate and new letter press were published. The new plate is entitled 'FALCO HYPOLEUCOS: *Gould*.', marked 'J. Gould and H. C. Richter del. et lith.', and shows two birds. Following the completion of the 36 parts of *The birds of Australia* (1840–48), Gould published the material in seven volumes under the same title (Gould 1848b). He directed the binder that 'the Plate and Description . . . of *Falco hypoleucus* in Part V. are to be cancelled, and the Plate and Description of . . . *Falco hypoleucus* in Part XXXVI. inserted in lieu thereof.' (Sauer & Evans 1989). Hence the seven-volume edition also includes Richter's plate; it is plate 7 in volume 1.

The four specimens mentioned by Gould.—Gould (1848a) stated: 'Up to the present time only four examples of this fine Falcon have been procured'. In the letter press to the Grey Falcon plate, he wrote: 'Of this rare and beautiful Falcon I have seen only four examples, three of which are in my own collection, and the fourth in that of the Earl of Derby. The specimen from which my description in the "Proceedings of the Zoological Society" was taken, was presented to Mr. Gilbert by Mr. L. Burgess, who stated that he had killed it over the mountains, about sixty miles from Swan River; subsequently it was obtained by Mr. Gilbert himself in the vicinity of Moore's River in Western Australia; and my friend Captain Sturt had the good fortune to secure a male and a female during his late adventurous journey into the interior of South Australia.' Gould did not clarify which of the four was in the collection of the Earl of Derby. We have only the certainty that Burgess' specimen was in Gould's collection.

Gilbert's specimen.—In August 1842, during his second stay at Swan River Colony, Gilbert visited the Moore River, north of the settlement, with James Drummond, the Government Botanist of Western Australia. Gilbert had not been that far north before. On 29 August, at or near a place called Nugadrine or Mugadrine (Drummond 1842, 1844), Gilbert shot a Grey Falcon.

In a letter to Gould, dated Perth, 13 September 1842 (Sauer 1999), Gilbert reported his collection of 'a beautiful Specimen of Falco hypoleucus'. He wrote: 'we reached a large River & Lakes nearly forty miles farther North than the Moore's River, where I for the first time saw & Shot the beautiful species of Falcon mentioned above . . . The Falco hypoleucos which I killed differs a good deal from your Plate, perhaps in consequence of Age; It is of a uniform ashy grey, *all over* . . . with very narrow lines of black running down the Centre of each feather, not, as in your plate, a pure white; It may be a new species, I wish it may, I assure you I never gazed with more delight on any Specimen I ever Shot, than on this Bird . . . the rich orange-yellow of the whole of the Face, & Legs contrasting beautifully with its delicate plumage. To sum up all, it was one of the most beautiful Birds I ever gazed on.'

He gave further details in another letter dated 9 October 1842, 'Falco hypoleucos. The following is the description of my Specimen before skinning. Its length was 15 Inches; Wing 12 3/4, Tail 6 1/4; Bill 2 1/2; Tarsus 1 3/4; metatarsus 2 1/4; Irides dark-brown; cere, all of the naked space around the Eyes, gape and usual [erroneous transcription for 'basal'] portion of Bill & Legs & feet brilliant orange-yellow. The yellow from the base of the Bill becomes gradually lighter, as it approaches the black tip of both mandibles, claws black' (Sauer 1999).

In a manuscript, Gilbert[4] mentioned that a 'mature specimen killed at the Moore's river was of much lighter colour than the foregoing description [a transcription of Gould 1840], and rather smaller in size, measured before skinned. Length, 15; wing, 12 1/2; tail, 6 1/2; bill, 2 1/4; tarsi, 1 3/4.' The discrepancies between Gilbert's two sets of measurements are not readily explained.

Regardless of the discrepancies, the wing and tail measurements indicate a female. The bill length appears erroneous, and the tarsus measurement is inconclusive regarding sex. If Gilbert had determined the sex of his specimen, e.g. by examination of the gonads, there is no mention of it in his notes and correspondence.

Nugadrine / Mugadrine (or Mugradine as misspelled by Whittell 1942) is unknown to me. A map of Gilbert's August route gives the final and northernmost point of the party's trip as the vicinity of Lake Dalaroo near the town of Moora, on the main (northern) branch of the Moore River (Whittell 1942). General direction and approximate distances from reference points given by Gilbert are consistent (Drummond 1842, 1844, Sauer 1999).

In sum, this specimen might be female based on the wing and tail measurements, despite Gilbert's impression of its smaller size compared to the type. From the plumage it is undoubtedly an adult. Gilbert collected it in August 1842 at or near the Moore River, around Moora, Western Australia.

The specimens from Depot Glen.—The two remaining specimens, secured by Captain Charles Sturt, 'were shot at the Depôt on a Sunday in May 1845, just after service' (Gould 1848a). Sturt (1849) wrote: 'This beautiful bird was shot at the Dépôt, at which place, during our long stay, Mr. Piesse, my storekeeper, was very successful with my gun. A pair, male and female, were observed by him one Sunday in May, whilst the men were at prayer, hovering very high in the air, soon after which he succeeded in killing both.' These two are, according to Mathews (1913), figured in *The birds of Australia* (Gould 1848a,c); the illustration shows an adult in the right foreground and a young bird at the rear. In reporting them 'hovering', Sturt most probably confused the term with soaring; the species is not known to hover but does soar very high (Schoenjahn in press).

The adult fits the description of adult Grey Falcon (Marchant & Higgins 1993), except that the yellow cere, the base of the upper mandible, bare ocular skin, and the toes are paler than the bright orange-yellow of wild birds (pers. obs.). Sturt (1849) also noted the vivid yellow cere and legs of the two birds. This slight discrepancy might have resulted from post-mortem changes during the *c.*3 years between the bird's collection and the illustration. It is unknown whether Richter, the illustrator, was provided with Sturt's description.

The plumage of the young bird in the illustration resembles both the description of juvenile (Marchant & Higgins 1993) and the description of the type (Gould 1840). However, the young bird in the illustration shows the same colour of the cere, upper mandible and skin around the eye as the adult bird in the illustration; that is consistent with Sturt's description (above). As previously mentioned young birds first have grey or light grey bills and grey skin around the eye; they acquire the yellow later. Therefore the young bird from Depot Glen is presumably older than the type.

The sex of both birds from Depot Glen is unclear. In the letter press to the Grey Falcon plate, Gould (1848a) noted: 'The Plate represents the two sexes of the natural size'. Sturt also referred to 'a pair, male and female', but it is unknown how he reached that opinion. No measurements were recorded for the two specimens.

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[4] 'Ornithological Notes—Gilbert.' p. 19. Queensland Museum Library, Brisbane.

In the letter press, Gould correctly described the differences between adults and juveniles. Unfortunately however, he neither mentioned the method used to sex the birds, nor did he inform which bird on the plate is, in his opinion, the male and which the female. Measurements taken from the illustration reveal that the two individuals are very similar in size, *contra* Meyer de Schauensee (1957).

Depot Glen, on Evely Creek, was within the boundaries of New South Wales at the time of Sturt's expedition in 1845–46 (Archer 1847) as it still is today (*cf.* North 1912).

Whereabouts of the four specimens.—In 1847–48, Gould's collection of Australian birds, including three specimens of *F. hypoleucos*, was sold to Philadelphia, after the British Museum had declined Gould's offer. The fourth specimen, being part of the collection of the 13th Earl of Derby, was transferred to the Derby Museum at Liverpool (Gould 1865) after the earl's death in 1851. The identities of the four specimens are now discussed.

Academy of Natural Sciences of Philadelphia (ANSP).—Gould sold his collection to Edward Wilson of Pembrokeshire, on behalf of his brother Dr Thomas B. Wilson of Philadelphia, a supporter and subsequent president of ANSP (Gould 1848c, Stone 1899, 1913). Before they reached Philadelphia, the specimens were sent to the firm Maison E. Verreaux in Paris, an emporium and dealership in natural history specimens run by three brothers. The specimens were mounted and shipped to Philadelphia with a complete list[5] handwritten by Jules Verreaux (Stone 1913). The three specimens of *F. hypoleucos* were listed as: 94, (Falco) Hypoleucus, (upside-down symbol for female, indicating male), W. Australia. 95, dito dito, ♀, S. Australia. 96, dito dito, (upside-down symbol for female, indicating male), W. Australia. The current designations are VN 94, etc.

Maison Verreaux.—At the Maison Verreaux, the specimens were 'mounted on wooden standards according to the custom of the times.'[6] Unfortunately all labels were removed, information lost, misinterpreted, or transcribed incorrectly. Some specimens disappeared. At the end of the 19th century Witmer Stone catalogued the entire ANSP bird collection including Gould's birds. In a number of papers, Stone described the fate of the specimens, though somewhat inconsistently.

Stone (1899) explained: 'Gould's collection, after purchase, was sent to Verreaux for mounting, and the original labels were removed, and their contents (or part of it) transcribed on the base of the stands, every specimen being marked "Type. Gould's *Birds of Australia*," no matter whether the species was Gould's or not!' Later he wrote: 'Verreaux prepared a manuscript-catalogue of the collection based, as some memoranda show, on an original catalogue of Gould's, which was apparently never sent over to America. The information contained in this catalogue is transcribed on the bottoms of the stands, and consists of the number, name, sex and locality of each specimen, with the addition of the legend: "Type, Gould, Bds. of Australia"—every bird being so marked regardless of whether it was the type of the species or not. The localities are usually very general, and are abbreviated. . ."W. Australia," or "S. Australia." . . . It is easy to see how a slight error in copying from the original catalogue would make "N. Australia" into "W. Australia," etc. . . . That a few errors have resulted from these causes is evident' (Stone 1913). We may assume that those errors were made by the Verreaux brothers as well as by Stone himself.

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[5] In a handwritten catalogue (held at ANSP), presumably by Jules P. Verreaux, of the Maison E. Verreaux, Paris, and probably in 1848, the entire collection of Gould's Australian birds was listed.

[6] Academy of Natural Sciences of Philadelphia (undated). Verreaux, Jules, 1807–73. Catalogs of birds, 1846–47. 24 items. In 'Archive list of the Academy of Natural Sciences of Philadelphia'. p. 36. Academy of Natural Sciences of Philadelphia, Philadelphia, PA.

I could not verify the existence of an 'original catalogue of Gould's'. It might seem plausible that Gould would have kept such a catalogue, especially when offering the collection for sale. The 'memoranda' mentioned above by Stone could include a document prepared by J. E. Gray, Keeper of Zoology at the British Museum. When Gould offered his collection to the British Museum in a letter dated 9 April 1847 (Datta 1997), Gray wrote to the museum's trustees next day, stating that the museum already possesses 'full two thirds if not more of the specimens offered' (Datta 1997). However, judging by the impreciseness of his estimate and the extremely short time to prepare the memorandum, Gray had not made an accurate comparison of the two collections, whether Gould provided a catalogue or not, meaning that this should not be seen as evidence for the existence of such a catalogue. Recent extensive searches for it at libraries and archives in England, Paris and at ANSP were fruitless, although J.-F. Voisin (*in litt.* 2009) informed me that he was aware of the original catalogue. Furthermore, the wooden stands inscribed with data cannot now be traced at ANSP (L. Joseph pers. comm.).

Dr T. B. Wilson formally presented the collection to ANSP in 1860 (Stone 1938). The specimens were initially exhibited as prepared by Verreaux, though later removed from their stands and relaxed as skins (N. Rice *in litt.* 2009). Stone (1913, 1938) pointed out that 1,858 specimens arrived at the ANSP, and that only a few were lost. Gould mentioned to the British Museum that his Australian collection consisted of nearly 1,800 specimens (Datta 1997).

Two of the three Gould specimens sent to ANSP are extant, VN 95 and VN 96. They are mentioned in Ingersoll & Fisher (2006) as ANSP 2098 (VN 95) and ANSP 2099 (VN 96). The latter is listed as the holotype, following Stone (1913) and Meyer de Schauensee (1957).

VN 94.—Meyer de Schauensee (1957) noted that VN 94 'cannot now be found and must have disappeared before 1890 for it was never entered in the Museum register when the collection was catalogued.' This was confirmed by a more recent search (Ingersoll & Fisher 2006). It seems likely that the specimen disappeared prior to 1890 with no evidence that it ever left ANSP (N. Rice *in litt.* 2009). It might never have reached Philadelphia. It was claimed that the age of VN 94 was specified in Verreaux's manuscript catalogue as adult (Meyer de Schauensee 1957), though this was not the case[5] (*cf.* Stone 1913).

ANSP 2098.—This specimen has one white label, bearing the imprint 'Academy of Nat. Sciences Philadelphia'. The label data are: 2098 Gould Coll. TYPE / ♀ Falco hypoleucus Gould / S. Australia Pres. by Dr. T. B. Wilson / and on the reverse, Verreaux catalogue number '95'. It is an adult. Measurements taken by N. Rice according to the specifications in Marchant & Higgins (1990) are: bill (C) 19.86 mm; wing (maximum chord) 318.5 mm; tail 158.0 mm. All three measurements fall well inside the respective ranges given by Marchant & Higgins (1993) for adult females. The locality is given as 'S. Australia', meaning either South or southern Australia. Of the four specimens, only one adult is from southern Australia, that from Depot Glen. Given the circumstances of Sturt's expedition 'into the interior of South Australia', Gould presumably assumed that the location is in South Australia and labelled it accordingly. On the basis of the plate by Richter (Gould 1848a) the sex of the Depot Glen adult cannot be determined. It is clear that ANSP 2098 is an adult on plumage and a female on measurements. The specimen is, very probably, the adult collected by Sturt's storekeeper Piesse, at Depot Glen in May 1845.

ANSP 2099.—Hitherto considered to be the holotype (Stone 1913, Meyer de Schauensee 1957, Fisher 1992, Ingersoll & Fisher 2006), this specimen is VN 96 of the Verreaux catalogue. It bears two labels, white and red, both with the imprint 'Academy of Nat. Sciences Philadelphia'. The data on the white label are: Gould Collection TYPE / ♂ Falco hypoleucus Gould / W. Australia / and, on the reverse, the Verreaux catalogue number '96'. The data on the red label are: TYPE OF Falco hypoleucus Gould / P.Z.S. 1840. p.162. The plumage matches Gould's description of the type and fits a juvenile (Marchant & Higgins 1993), especially the bold black spots on the white underparts. Bare-parts colours are: cere yellow; maxilla and mandible rich orange-buff at the base, nearly black at the tips. The ocular skin is dark orange-buff, and the legs / toes are concolorous with the bill. The specimen was measured by N. Rice (Table 1) whose data are all well inside the respective ranges for juvenile females, and outwith those for juvenile and adult males. It was also measured by Meyer de Schauensee (1957) and by C. Fisher. Table 1, however, demonstrates the problems associated with such measurements and the uncertainties regarding technique and precision employed. But, VN 96 / ANSP 2099 is a young bird based on plumage and a female on measurements.

National Museums Liverpool specimen.—One of the four specimens known to Gould was held in the collection of the 13th Earl of Derby. Concerning this bird, in 1865 Gould added in a footnote: 'The last-mentioned specimen is now in the Derby Museum at Liverpool, to which town his Lordship bequeathed his fine collection.' (Gould 1865). Gould omitted the origin of that specimen.

Lord Stanley, who became the 13th Earl of Derby in 1834, died in 1851. The donation of his natural history collection to Liverpool led to the foundation of the Derby Museum, now part of the National Museums Liverpool. The Earl, President of the Zoological Society of London from 1831 until his death, was a great supporter of Gould (Fisher 1987). He subscribed to all of Gould's work and bought many specimens from him. In his preface, Gould (1848c) wrote 'the Earl of Derby, who has at all times most readily submitted to my inspection every collection of which he has become the possessor . . . allowed me the free use of any objects desirable for the enhancement of the "Birds of Australia"'. Mearns & Mearns (1998) noted that the Earl 'bought 230 of the bird and mammal specimens John Gilbert sent to Gould' and 'became one of Gould's best customers.'

A letter from the Earl to Gould, dated April 1842, lists his desiderata, including '*F. hypoleucus*' (Sauer 1999). At the time, the only specimen was Gould's holotype. Hence the Earl must have acquired his specimen thereafter. There is no indication from where it came. Gilbert collected only one specimen, and there is no reason to assume he did not send it to Gould, still awaiting Gould to confirm the species. Further, it is plausible that Gould acquired Sturt's two specimens together, possibly direct. We know that at least one had to be in Gould's collection. It seems unlikely that Sturt, assuming they were a pair, presented only one of his birds to Gould, and the other to the Earl. More plausible is that Gould, after receiving Gilbert's specimen but probably before receiving the two from Sturt, sold Gilbert's specimen from the Moore River to the Earl, knowing that he, Gould, would have access to it should he need.

It also can be assumed that the Earl did not acquire a second Grey Falcon before his death, otherwise Gould would have known about it by 1865. In the *Handbook to the birds of Australia* (1865), Gould re-affirmed: 'In the folio edition of the 'Birds of Australia' I stated that four specimens were all that were then known; in the lengthened interval which has since elapsed, about the same number, and not one more, have come under my notice' (Gould 1865: 25). Although this sentence leaves room for misinterpretation, from the context it is clear that those early four specimens were the only ones Gould had seen when writing the *Handbook*.

The National Museums Liverpool currently holds one specimen of Grey Falcon. The label data represent all known information: 'Falco hypoleucos ♂ Mus. Derbianum. Liverpool.' 'Mus. Derbianum' indicates the collection of the 13th Earl of Derby (C. Fisher *in litt.* 2009). This specimen was considered lost as recently as 2006, with no trace in the Earl's collection at Liverpool or any evidence of an exchange (Ingersoll & Fisher 2006). Fisher located the specimen in March 2009 upon my inquiry. It had been given in error a Derby Collection number, LIVCM D.4001c, which pertained to a missing cuckoo. A new accession number was assigned to the specimen in April 2009, LIV.2009.22 (C. Fisher *in litt.* 2009).

Measurements, taken by C. Fisher in accordance with Marchant & Higgins (1990), are: bill (C) 17.8 mm; bill (front edge of feathers to tip) 20.3 mm; wing (natural and maximum chord) 285 mm for both wings; tail 157 mm, tip of longest tail feather very worn. These measurements of LIV.2009.22 must be considered inconclusive regarding the sex, although it is possibly female. From photographs, the specimen is an adult on plumage.

C. Fisher (*in litt.* 2009) reports that the specimen did not 'feel' like a typical Gilbert skin, being too heavy, though it had been mended *c.*20 years ago. Whether the distinct neatness of the specimen today is a result of its first preparator's expertise or of recent conservation is unknown.

We know with certainty the origin of the four specimens, and that the bird in the Earl's collection is one of the four. In the absence of any contrary evidence, it must be concluded that the Earl of Derby's specimen is LIV.2009.22, which is one of the two adults known to Gould, and either that collected by Gilbert or that secured by Sturt. The putative sex of Gilbert's bird (personally measured by him) is female, but that of LIV.2009.22 (measured by C. Fisher) is considered uncertain (albeit possibly female). In the absence of any measurements for Sturt's bird, the origin of LIV.2009.22 cannot be determined from measurements.

VN 95 / ANSP 2098 is an adult by plumage, a female on measurements and a female according to the Verreaux catalogue, and originates from 'S. Australia', again according to the Verreaux catalogue. Gilbert's specimen, however, also adult, is from Western Australia. This suggests that VN 95 / ANSP 2098 is the adult secured by Sturt. That leaves Gilbert's specimen, the only other adult known to Gould, to be that in the collection of the Earl of Derby and hence almost certainly LIV.2009.22. Because LIV.2009.22 is an adult, it can be deduced that both young birds were in Gould's collection.

Stone's determination of Gould's types.—Stone (1899) wrote: 'By careful study and comparison with the original descriptions it is possible to select the specimen which agrees in plumage, measurements and locality with the description in nearly every case, and such ones I have designated as the type.' With G. M. Mathews, Stone prepared a list of the Australian species described by Gould, noting the location of their types (Stone 1913). The type of *F. hypoleucos* is listed under no. 366. The no. 2099 of the ANSP catalogue is given, followed by the no. 96 of the Verreaux catalogue, the symbol ♂, and the note 'West Australia=Type'.

However, Stone's (1913) list is known to contain errors and inaccuracies (Fisher 1992). Fisher (1992) wrote: 'This is emphasized by a revealing letter from Rudolf Meyer de Schauensee, Curator of Birds at the Academy in the 1950s, to Reg Wagstaffe, Keeper of Vertebrate Zoology at Liverpool in the same period. The letter, sent in October 1956, refers to Stone's (1913) manuscript: "I have always felt this list to be very unsatisfactory, for Stone, as far as I can see, merely selected a type from the Gould series without stating what the probability was that the specimen was really the one used by Gould to describe the species."' In the case of the Grey Falcon, however, Stone was certain that he identified the type specimen correctly. He closed with the remark: 'This is unquestionably the bird described by Gould, although in his Handbook [Gould 1865] he says the type was a young female' (Stone 1913).

Importantly, however, VN 94 was already missing when Stone catalogued the collection, meaning that he could only choose from two specimens, one adult and one juvenile, and he therefore chose the only juvenile available. Gould had two young Grey Falcons in his collection, VN 94 and VN 96. Both matched Gould's description of the plumage of a young bird in lacking any reference to the colour of the bare parts. With VN 94 missing, Stone felt certain of his choice.

Meyer de Schauensee's type specimen.—Critical of Stone's work, Meyer de Schauensee (1957) compiled a list wherein he discussed Gould's types. However, there are grave errors in that work regarding *F. hypoleucos*. For *F. hypoleucos* he specified: '*Holotype.*—♂ imm. (= ♀ imm.), No. 2099* (96), West Australia, Gould Collection. Measurements of type.—Wing 326, tail 157, culmen 19, tarsus 49 mm.' He went on to claim that ANSP 2099 'agrees exactly in plumage and almost exactly in wing length (326 mm. = 12.6) with the bird described by Gould.' (Meyer de Schauensee 1957).

Regarding plumage, it is undisputed that both Gould's type and ANSP 2099 are juvenile. As demonstrated above, Gould's description does not mention the colour of the bare parts. Meyer de Schauensee regretted that he had not seen Gould's plate published in 1841 (Meyer de Schauensee 1957).

The wing length reported by Meyer de Schauensee, 326 mm, is in fact equal to 12.8 inches. Therefore, the wing length of Meyer de Schauensee's chosen type differs by one third of an inch, or *c*.8.5 mm, from Gould's measurement (Table 1).

Meyer de Schauensee (1957) further mentioned the missing specimen VN 94, stating that it was listed by Verreaux as an adult. Ages, however, are not provided in Verreaux's catalogue. Meyer de Schauensee failed to draw any conclusion from what he decidedly had known—that two of the four specimens mentioned by Gould (1848c) were young. Evidently, Meyer de Schauensee's selection of the type is also flawed.

Gould's type.—The type specimen was illustrated by Elizabeth Gould. The only other young bird among the four specimens is that from Depot Glen, illustrated by H. C. Richter. To draw conclusions from the difference of the colour of the bill and the ocular skin between the two illustrations, the artists' accuracy and the effect of post-mortem changes on the skins are discussed here.

Both artists worked from skins. Although the plumage can generally be expected to be depicted fairly accurately, the soft parts and to some extent the bill may have undergone post-mortem changes (R. McGowan *in litt.* 2009). The holotype was illustrated by Mrs Gould within *c*.2 years of its collection. The two specimens from Depot Glen were illustrated by Richter 2–3 years after collection.

To demonstrate Mrs Gould's accuracy at the time, I investigated her plate of four Satin Bowerbirds *Ptilonorhynchus violaceus* in Gould (1841a). That plate contains an example of a specimen available today that was illustrated by her. The plate is titled 'PTILONORHYNCHUS HOLOSERICEUS: Kuhl', and marked 'J&E. Gould del. et lith.' Elizabeth lithographed the plate around the same time as the *F. hypoleucus* plate, during the last year of her life, i.e. after returning to London around 18 August 1840 from Australia (Datta 1999). She died on 15 August 1841. It appears evident that the illustration of the subadult male on the far left was taken from ANSP 3169 of the Gould collection at ANSP (L. Joseph *in litt.* 2009; *cf.* Ornithology at the Academy of Natural Sciences [online bird collection database], available at http://clade.ansp.org/ornithology/index.php). Of interest are that the colours of the bill and the soft parts of that specimen, as observed today, match the illustration very well. As for the accuracy of Richter's work, see the adult *F. hypoleucos* in Gould (1848a). I demonstrated above that this bird most probably is ANSP 2098. The analogous bare-parts colours between the illustration and the specimen are discussed above.

If VN 96 / ANSP 2099 was the type, its bill, since having been illustrated by Mrs Gould, must have changed from being basally grey to rich orange-buff. Furthermore, the bare ocular skin must have changed from dark grey to dark orange-buff. Post-mortem change in the colour of soft parts and, to some extent, of the bill can be expected, but it seems highly unlikely that the changes would be of the magnitude just described. Thus I conclude that VN 96 / ANSP 2099 is almost certainly not the holotype as hitherto assumed, instead the type specimen of *Falco hypoleucos* Gould, 1841, is probably VN 94, which is now missing. Recent extensive searches for it, by N. Rice at ANSP and by J.-F. Voisin at the Muséum National d'Histoire Naturelle, Paris, have proven fruitless.

Name, spelling and citation.—In the first publication concerning the species (Gould 1840), the name was spelled *Falco hypoleucos* and was mentioned just once. According to the *International code of zoological nomenclature* (ICZN 1999) this is the 'correct original spelling' (Art. 32). The spelling of *F. hypoleucos* results from the combination of a Latin generic name with a Greek specific epithet. In Greek, the terminus -os is correct (W. Boles *in litt.* 2009). Although Gould (1840) named the species *F. hypoleucos*, he used -us subsequently (Gould 1841b), which inconsistency was reflected in the literature until about the mid 1970s, since when the correct terminus -os has prevailed. However, -us was used by Gould (1841b), Mathews (1915–16), RAOU (1926), Serventy & Whittell (1948, 1976) and Gruson (1976). Gould (1848a, 1848c) and Cayley (1984) used *hypoleucus* in the text and *hypoleucos* in the title of the illustration. The suffix -os was used by RAOU (1913), Peters (1931), Whittell & Serventy (1948), Clements (1974), Condon (1975), Storr & Johnstone (1979), Howard & Moore (1980), Walters (1980), Sibley & Monroe (1993), Debus *in* del Hoyo *et al.* (1994), and Christidis & Boles (1994, 2008). According to the *Code*, the following citation is correct (Art. 22): *Falco hypoleucos* Gould, 1841. If the date inscribed on the publication is of interest, *Falco hypoleucos* Gould, 1841 [1840] should be used.

The English name used by Gilbert on his collection data sheet, *c.*1839, was 'White Falcon' (see footnote 1). Gould used 'White-breasted Falcon' in *The birds of Australia* (1841b). Both these names make effective reference to the type's juvenile plumage. It was only in part 36 of *The birds of Australia* (Gould 1848a) that the name Grey Falcon was introduced, by which time Gould had seen two adults.

Gilbert also noted on the collection data sheet: 'Aboriginal name. Gwet"=el=bur (Mountain)'. Subsequently, he must have realised that 'Gwet-el-bur' may be a general name and probably not specific to *F. hypoleucos*. On a list entitled 'The Birds of West Australia'[7], item no. 5 is 'Falco melanogenys Gwet"=ul=bur. Aborigines generally.' The 'generally' may refer to its use for all falcons and medium-size raptors, or to its common usage by different language groups, or both. Gilbert also noted: 'Falco hypoleucos. Boor"=ga. Aborigines of Moore's river, in the interior.' This was repeated elsewhere[8].

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[7] The birds of West Australia [ms, presumably 1842]. In 'Gilbert, John (Australia) 8 ms booklets, c.1841–45.' In 'John Gould (1804–81). Papers and correspondence, Z MSS GOU A and B [microform]: [M2888–2902]. Mfm M2902, No. 6'. Australian Joint Copying Project, Canberra.

[8] The birds of Western Australia [ms, presumably 1842]. In 'Gilbert, John (Australia) 8 ms booklets, c.1841–45.' In 'John Gould (1804–81). Papers and correspondence, Z MSS GOU A and B [microform]: [M2888–2902]. Mfm M2902, No. 7' [a revision of 'No. 6']. Australian Joint Copying Project, Canberra.

Discussion

The type specimen of *F. hypoleucos* Gould, 1841, was previously considered to be VN 96 / ANSP 2099 (Stone 1913, Meyer de Schauensee 1957, Fisher 1992, Ingersoll & Fisher 2006). However, the evidence suggests that the holotype is VN 94, which is apparently no longer extant. Two major reasons for the false identifications are identified above. Firstly, none of the previous authors examined the plate by Elizabeth Gould illustrating the type (Gould 1841b, first plate). Secondly, VN 94 was already missing when Stone selected the type. It is the holotype, there are no paratypes.

Gould (1865) claimed that the holotype is female, but without explaining his rationale, although the measurements he had previously provided (Gould 1840) do suggest this probability. Verreaux's catalogue stated the sex of VN 94 as male. It can be safely aged as a juvenile, and the type locality is York, on the Avon River, Western Australia, and not the Moore River as stated by RAOU (1926).

The specimen held at the National Museums Liverpool, LIV.2009.22, almost certainly is Gilbert's specimen collected in August 1842 near Moora on the Moore River, Western Australia. It is an adult. The sex of LIV.2009.22 cannot be determined with certainty, but it is possibly a female based on Gilbert's measurements. The label of LIV.2009.22 specifies male with no indication regarding the source of that information.

The other two of the four specimens are held at the Academy of Natural Sciences of Philadelphia. They are most probably those collected by Sturt's storekeeper, Piesse, at Depot Glen, New South Wales, in May 1845. They were illustrated by H. C. Richter (Gould 1848a,c). One, specimen VN 95 / ANSP 2098, is an adult. The second is younger, and is VN 96 / ANSP 2099. Both are females on measurements, which is consistent with their similar sizes on Richter's plate, but contrary to Gould's statement in the letter press. The sex of VN 95 is consistent with the Verreaux catalogue, but VN 96 is listed in the latter catalogue as male.

Both young birds, VN 94 and VN 96, were listed by Verreaux as males but both are probably females. Because Verreaux did not specify ages it is unknown if he misinterpreted juvenile plumage as pertaining to males.

Age-related variation in plumage and bare-parts coloration in Grey Falcon is poorly documented. Differences in the colour of the soft parts of the two young birds were crucial to the present investigation. Further age-related morphological variation will be discussed elsewhere. That the holotype of *F. hypoleucos* is a juvenile led Mathews (1913) to name a new subspecies, *F. hypoleucos ashbyi*, when presented with an adult specimen. That issue will also be discussed elsewhere.

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Studies of Socotran birds VI. The taxonomic status of the Socotra Buzzard

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SUMMARY.—The resident, short-winged *Buteo* population on Socotra, despite having been known for over 110 years, has never been formally named. Now that it has been extensively studied in the field and its characters understood, we believe that it should be described. Like all other members of the *B. buteo* superspecies (*sensu* Kruckenhauser *et al.* 2003), it is relatively poorly differentiated genetically from most Old World buzzards, but is closest to *B.* (*b.*) *bannermani* of the Cape Verde Islands and the comparatively widespread Long-legged Buzzard *B. rufinus* of the southern Palearctic. It shares morphological features with several other Afrotropical buzzards, especially *B. oreophilus*, and *B. buteo vulpinus*, but is clearly well differentiated from *B. rufinus* and *B.* (*b.*) *bannermani* in this respect. Taxonomic judgements concerning this superspecies are inherently problematic because it represents an obviously recent radiation and because of difficulties in establishing which characters might be considered taxonomically informative. We elect to describe this population at species rank to highlight its highly unusual position within the superspecies, both genetically and morphologically. Finally, we present notes on its breeding biology (season September–April), population size (<250 pairs), behaviour (similar to Common Buzzard *B. buteo*), diet (reptiles and invertebrates), moult (November to April) and conservation prospects (the taxon should probably be ranked as Vulnerable according to IUCN criteria).

Exclusively Old World representatives of the genus *Buteo* represent a relatively young and taxonomically complex radiation of raptors (Griffiths *et al.* 2007) that numbers at least nine species (Ferguson-Lees & Christie 2005). Relevant to the following discussion, Common Buzzard *B. buteo* is the most widespread species, occurring across temperate latitudes of the entire Palearctic. One race, *B. b. vulpinus*, breeds from northern and central Europe to Central Asia, and winters in eastern and southern Africa, as well as through southern Asia, and moves through the Middle East in large numbers, including across the Bab al Mandab strait to the Horn of Africa in autumn (Shirihai *et al.* 2000). Another race, *B. b. bannermani*, is endemic to the Cape Verde Islands. Long-legged Buzzard *B. r. rufinus* occurs from central Europe to Mongolia and northern India, with some northern populations migrating as far as sub-Saharan Africa, although only small numbers are observed on passage through the Middle East (Shirihai *et al.* 2000). The smaller *B. r. cirtensis* is largely sedentary through North Africa and Arabia. The exclusively Afrotropical Mountain Buzzard *B. oreophilus* also comprises two subspecies (sometimes treated specifically). Nominate *oreophilus* occurs from Ethiopia discontinuously south to Malaŵi, whilst *B. o. trizonatus* (Forest Buzzard) is restricted to South Africa (Clark 2007), from Transvaal to the Cape Peninsula (Dickinson 2003).

Despite lacking taxonomic recognition, the *Buteo* population on the ancient island of Socotra has attracted considerable interest, equal to or arguably greater than that devoted even to the majority of the archipelago's endemic bird species and subspecies. Our purpose here is to summarise existing and unpublished rationale for recognising this insular population taxonomically, to offer support for the ranking we propose, and to name this population, at long last. But, first, a résumé of this isolated population's history is warranted.

History and background

A breeding population of buzzards was initially discovered on the main island of Socotra during the course of the H. O. Forbes (British Museum) and W. R. Ogilvie-Grant (Liverpool Museum) expedition of 1898/99, the comprehensive ornithological results of which were published four years later (Ogilvie-Grant & Forbes 1903). This expedition secured four specimens of a *Buteo*, two of which are nowadays held in The Natural History Museum, Tring, and the other two in the National Museum and Galleries on Merseyside, Liverpool (*cf.* Frost & Siegfried 1970). Ogilvie-Grant & Forbes (1903) listed them as *Buteo desertorum*, although the two Liverpool specimens were labelled as being *Buteo brachypterus*, Hartlaub, 1860, a name nowadays restricted to the buzzard of Madagascar (Dickinson 2003). Earlier visitors to the island had either overlooked the presence of a *Buteo* or had at least failed to collect it (the results of previous ornithological work were limited to lists of specimens, with descriptions of the novelties: Sclater & Hartlaub 1881, Hartlaub 1881). Thereafter, Hartert (1914: 1127) briefly mentioned that the Socotran birds merited taxonomic attention. Two further specimens, both taken by M. T. Boscawen and R. E. Moreau, in March 1934, are also held in Tring, since when only two further visitors to the island have collected birds: G. Popov in 1953 (whose research was principally devoted to desert locusts) and A. D. Forbes-Watson in 1964 (whose remit was almost entirely avifaunal). Neither collected any specimens of the *Buteo*; indeed, Forbes-Watson (1964) wrote in his unpublished expedition report that the buzzards 'had a genius for being wary when one had a gun'. Ogilvie-Grant's experiences had been similar (Ogilvie-Grant & Forbes 1903: 48).

In writing up the results of Forbes-Watson's work, Ripley & Bond (1966) were unable to identify the buzzard to subspecies. Based on an examination of the British Museum material, nevertheless, they considered that the morphometrics of at least three of the four birds were generally within the range of *B. b. vulpinus*, thereby hinting at the possibility of both resident and non-resident (perhaps simply passage migrant) populations. Forbes-Watson's (1964) unpublished report also suggested their identity as *vulpinus*, but admitted the need for additional work, and (*in litt*. 1969, quoted in Frost & Siegfried 1970) thought that two populations might exist on Socotra. However, he admitted that he had not witnessed any obvious migration during the spring he spent on the island. Brown *et al.* (1980) actually mapped both *Buteo buteo* and *B. oreophilus* as occurring on Socotra, presumably in deference to the two-population theory; Frost & Siegfried (1970) had also postulated that one of the British Museum series might be *B. b. vulpinus*. These latter authors considered resident birds to be intermediate between *oreophilus* and *vulpinus*, albeit closer to the latter, and concluded that they might be treated as a separate race of *B. buteo*. However, they refrained from naming it, because they had only been able to examine one adult specimen. It is worth remarking that extensive field observations from at least seven months of the year, since 1993, have produced just one record of *B. b. vulpinus* on Socotra (see Distribution and population size) and none of *B. rufinus* or any other buzzard taxon.

Thereafter, de Naurois (1973, 1987) drew attention to the apparently analogous situation of the buzzards on Socotra and those on the Cape Verde Islands, off the western coast of Africa, which latter had been named as *Buteo b. bannermani* Swann, 1919, and in this he was echoed by James (1986). De Naurois (1973) suggested that these *Buteo* populations might represent relics of a now-extinct pre-Pleistocene African buzzard, which had served as a prototype for *Buteo* populations that had colonised the Palearctic subsequently with the advent of favourable climatic conditions. This was more or less the reverse of the theory espoused by Moreau (1966). However, de Naurois (1987) subsequently mooted that *bannermani* and the Socotran birds represent residual populations of a continental extinction that occurred as the African mainland became desertified, and suggested (quite correctly) that these insular populations were likely to prove closest to *B. rufinus*. Thus all three might be descended from a single ancestor that had inhabited the Saharan region prior to the last Würmian glaciation (i.e. the final and most extreme glacial epoch of the Pleistocene, which reached its peak *c.*18,000 B.P.). Thereafter, Hazevoet (1995) elevated *bannermani*, the Cape Verdean population, to species rank under the phylogenetic species concept, and Martins & Porter (1996), in noting Hazevoet's case, suggested that the Socotran population might be best treated similarly. Together with the nesting details presented by Clouet *et al.* (1994), observations made in April 1993 (Martins & Porter 1996) became the first detailed remarks on the Socotran population to be based solely on in-depth field experience. Additional field observations were published by Clouet *et al.* (1998).

Clouet & Wink (2000) subsequently published the results of a small-scale genetic study, using mitochondrial DNA, of the buzzards of the Cape Verdes and Socotra. It found evidence to suggest that *B. buteo* and *B. oreophilus* are close relatives, and that *B. bannermani*, *B. rufinus* and the Socotran *Buteo*, which they referred to as '*B. socotrae*', clustered closely. Because genetic distances between virtually all of the taxa sampled were not large—a finding echoed by Schreiber *et al.*'s (2001) and Kruckenhauser *et al.*'s (2004) studies of *B. buteo* subspecies, and the much broader study of Lerner *et al.* (2008)—the relatively small differences between the latter three were interpreted by Clouet & Wink (2000) as support for either two or three species, with Socotran birds either to be 'named *bannermani* (because of the identical nucleotide sequence) or alternatively *Buteo socotrae* owing to its isolated and remote situation.' Londei (2003) remarked that his field observations of *bannermani* in the Cape Verdes also suggested that the insular population possesses more traits in common with *rufinus* than *buteo*, thereby providing additional support for Clouet & Wink's (2000) conclusions.

Most recently, the molecular study of the genus *Buteo* published by Riesing *et al.* (2003) and Kruckenhauser *et al.* (2004), which also used mitochondrial markers (coupled with analyses of morphometrics and morphology), found that amongst the very recent radiation defined by the *B. buteo* superspecies, Socotran birds again clustered closer to *B. rufinus* (including *B. r. cirtensis*) than *B. buteo*. However, in the Kruckenhauser *et al.* (2004) analysis of morphological and morphometric characters, Socotran and Cape Verdean buzzards grouped with *B. b. rothschildi* of the Azores, presumably as a result of convergent adaptation to dry-country habitats. Kruckenhauser *et al.* (2004) recommended that the *B. buteo* superspecies be treated as three allospecies, namely *B. buteo*, *B. rufinus* and *B. oreophilus*, whilst admitting that (a) it would be defensible under the Biological Species Concept to treat all of the constituent taxa as a single species, and (b) the situation concerning *bannermani* and '*socotrae*' was almost a matter of choice. Because genetic differentiation is apparently small amongst members of the *B. buteo* superspecies, even between taxa traditionally ranked as species (e.g. between *B. buteo* vs. *B. rufinus*, and *B. oreophilus* vs. either of the other two taxa), and because morphologically the Socotran population shares more traits with *B. buteo vulpinus* and *B. oreophilus sensu lato* (especially *B. o. trizonatus*; see Diagnosis and Table 3), we circumscribe it here as a new species under the Biological Species Concept (*sensu* Helbig *et al.* 2002). Although Clouet & Wink (2000) introduced '*socotrae*' as a potential name for this population, and in referring to the Socotran population thus they were followed by Riesing *et al.* (2003) and Kruckenhauser *et al.* (2004), this name is a *nomen nudum* and has no validity because its initial use cannot be considered a valid nomenclatural act according to the *International code of zoological nomenclature* (ICZN 1999, Arts. 13.1.1, 16.1, 16.4 and 72.3).

Buteo socotraensis, sp. nov.
Socotra Buzzard

Holotype.—The Natural History Museum (formerly British Museum of Natural History), Tring (NHM 99.8.11.10). Adult (unsexed) collected by W. R. Ogilvie-Grant and H. O. Forbes at 'Elhe' (locality not precisely traced), on the Hadibu Plain, in the north of the main island of Socotra, on 28 January 1899 (Fig. 1); no other label data.

Paratypes.—The Natural History Museum, Tring. Adult male, NHM 1934.8.12.2, collected 9 March 1934, by Colonel M. T. Boscawen at Momi (altitude *c*.450 m) on the main island of Socotra; juvenile female, NHM 1934.8.12.3, collected on 9 March 1934, by Colonel M. T. Boscawen, at Momi (altitude as previous), on the main island of Socotra; juvenile female, NHM 99.8.11.11, collected on 22 January 1899, by W. R. Ogilvie-Grant and H. O. Forbes, at Homhil (altitude *c*.900 m), in the east of the main island of Socotra. No other label data. Measurements of the holotype and paratypes are presented in Table 1.

TABLE 1

Measurements of endemic *Buteo* taxa on Socotra and the Cape Verde Islands, based on specimens held at The Natural History Museum, Tring, taken by GMK according to standard parameters (i.e. flattened wing, bill to skull, and tarsus to last complete scale before the toes diverge), using a metal wing-rule with perpendicular stop at zero (accurate to 0.5 mm) and, for culmen and tarsus, digital callipers (accurate to 0.01 mm).

	Locality	Date (collector)	Age / sex	Wing	Tail	Culmen (tip to skull)	Tarsus
Buteo socotraensis							
NHM 99.8.11.10 (holotype)	Elhe, Hadibu Plain	28 January 1899 (Ogilvie-Grant & Forbes)	Adult unsexed	350 mm	189 mm	33.33 mm	66.34 mm
NHM 1934.8.12.2 (paratype)	Momi	9 March 1934 (Boscawen)	Adult male	366 mm	188 mm	38.19 mm	64.05 mm
NHM. 1934.8.12.3 (paratype)	Momi	9 March 1934 (Boscawen)	Juvenile female	341 mm	190 mm	33.98 mm	63.67 mm
NHM 99.8.11.11 (paratype)	Homhil, east Socotra	22 January 1899 (Ogilvie-Grant & Forbes)	Juvenile female	267 mm (not fully developed)	135 mm (not fully developed)	33.08 mm	74.68 mm
Buteo (buteo) bannermani							
NHM 1919.8.15.148 (holotype)	São Vicente	26 September 1913 (Bannerman)	Female	367 mm	194 mm	38.4 mm	74 mm
NHM 1911.12.23.436*	'Santiago' (= Boavista; *cf.* Hazevoet 1995)	February 1897 (Boyd Alexander)	Female (by label, or immature male: Hazevoet 1995)	385 mm	177 mm	36.9 mm	75 mm

*Identified as Long-legged Buzzard *Buteo rufinus cirtensis* by James (1984, *cf.* Hazevoet 1995), a species otherwise unknown from the Cape Verde Islands, but its measurements appear to preclude this possibility (see Table 2).

Description of holotype.—Colour codes (in parentheses) follow Smithe (1976). See also Fig. 1. Forehead, crown, nape, ear-coverts and moustachial area pale Fuscous (21) with narrow white streaking on ear-coverts and moustachial area. Chin, throat, breast and upper belly white with Burnt Umber (22) streaking, finest on chin and throat, broadening on breast and heaviest on belly, where the brown becomes more solid, especially on body-sides and flanks. This streaking is the result of dark (midway between Fawn Color [25] and Clay Color [26]) arrowhead-shaped centres to the off-white feathers. Lower belly off-white barred or vermiculated warm Drab (27), the broadest bars being 8 mm, narrowing to 2 mm at tip of feathers. Undertail-coverts predominately white with very sparse, narrow vermiculations, of a Clay Color (26) and even sparser Burnt Umber (22) shaft-streaks. Thighs and tarsal feathering predominately chestnut-tinged Raw Umber (23), with barely perceptible whitish-buff tips to feathers, closest to Buff (24). Underwing: axillaries white, barred Raw Sienna (136), with Burnt Umber (22) shaft-streaks and variable whitish feather tips; the entire coverts having a rather chequered pattern. Carpal extensive Dark Grayish Brown (20), the outer margin tending to pale Sepia (119). Primaries off-white with Sepia (119) webs and broad tips. Secondaries and tertials off-white with narrow, diffuse Vandyke Brown (121) barring and extensive broad tips, the outermost band (of some 23 mm in width) the darkest; thus forming a distinct band along hindwing. Scapulars, wing-coverts, tertials and back pale Fuscous (21) with dark Burnt Umber (22) shaft-streaks. Mantle Fuscous (21) with some Amber (36) and whitish feather-fringes. Primaries and small tertial Fuscous (21); secondaries and larger tertials pale Fuscous (21) with darker shaft-streaks. Rump pale Fuscous (21); uppertail-coverts brown, closest to Olive-Brown (28) with whitish tips and very pale Amber (36) vermiculations. Uppertail overall Pale Neutral Gray (86) with pale Vandyke Brown (121) vermiculated barring; basal bars 5–6 mm in width, narrowing to 2–3 mm over distal portion, except for subterminal band of 7 mm (Fig. 2). Note, however, that the distal third of all rectrices show warm elements close to Mikado Brown (121c), concentrated on the shaft region, but barely perceptible on the central feathers. Undertail dirty white with narrow pale to very pale Vandyke Brown (121) barring.

Diagnosis.—Because of the relatively few available specimens of the new taxon, the following analysis is complemented by our and fellow observers' field observations since 1993. During seven days in March–April 1993, RFP & GMK *et al*. observed a total of 31 individuals, including three juveniles (Kirwan *et al*. 1996). Subsequently, during nine visits spanning six months between 1996 and 2008, RFP *et al*. observed a total of 181 individuals. Of these 43 were aged (33 adults and ten juveniles). Field descriptions were taken of 12 birds and photographs of 21 (15 adults / subadults and six juveniles). These data were supplemented by reference to other photographs by co-workers and some published images, e.g. in Clouet *et al*. (1994), all of which were studied carefully. Our sample of *B. (b.) bannermani* specimens was also very small and was therefore also supplemented by reference to field photographs. Of the five taxa to which it has been linked taxonomically, *Buteo socotraensis* is slightly larger than *B. oreophilus* and probably slightly smaller than *B. bannermani* (Table 2; *cf*. Ferguson-Lees & Christie 2001: 693), although the small sample sizes of the first- and last-named must be borne in mind. It is thus a small to mid-sized *Buteo* with brown upperparts and pale underparts, which are barred and blotched brown on the breast, belly and underwing-coverts. Individual plumage variation in both adult and juvenile plumages is less than in any of the other members of the *B. buteo* superspecies, as might be expected in an insular taxon. In adult plumage the brown upperparts are relieved only by pale bases to the outer primaries, which form a diffuse but noticeable panel (Fig. 3), which this species shares with *B. rufinus* and some *B. b. vulpinus*, but not with *B. oreophilus* or *B. bannermani*. The uppertail is narrowly barred as it is in most *B. b. buteo* and some *B. b. vulpinus*. In *socotraensis*, nevertheless, the pale greyish tail, often showing a gingery hue, especially distally, has 10–12 narrow, dark bands, with the subterminal the broadest. In the morphologically most similar taxa, specimens of *oreophilus* at NHM have 6–7 dark bands of equal width to the pale bands, whilst *bannermani* has 8–11 bands, also of equal width to the pale bands, which are less grey than in *socotraensis*. However, W. S. Clark (*in litt.* 2010) reports that *oreophilus* typically has a dark tail with narrow pale bands and a broad dark tip, thus resembling the pattern in *B. b. buteo*. Furthermore, in *bannermani* it appears that the subterminal band is of similar width to the other bands (see Fig. 2). Adults of the larger *rufinus* have a distinctly orange-toned, unbarred tail.

Below *socotraensis* is white (very slightly tinged buff) with fine brown streaking on throat and heavier dark brown streaking on the breast, belly, flanks and thighs, becoming most solid, albeit variably, there (Figs. 1, 4 and 5). This pattern is quite different from that in all *B. rufinus* (Fig. 6), except some dark birds including *B. r. cirtensis*. The warm brown / chestnut-brown underwing-coverts in *socotraensis* are rather irregularly streaked and chequered dark brown, most intensely on the greater coverts. The large carpal patch is solid dark brown. The variation in the strength or intensity of these underbody and underwing-covert markings is slight (Figs. 7–8). Some individuals possess a whiter throat, upper breast and thighs. The large dark carpal patch is shared with typical *rufinus*, but not by *B. b. buteo* and *B. b. vulpinus* in which it is far less pronounced, especially in those birds that are darker below (Fig. 9). In such birds, unlike *socotraensis*, the chin, throat and upper breast are streaked dark brown, often bordered by a pale horseshoe below; this is a feature apparently never found in *socotraensis*. In this respect, moreover, *bannermani* is patterned more like *B. b. buteo* and *B. b. vulpinus* (Fig. 10). The underside of the primaries and secondaries is similar to that of the other *Buteo* taxa, showing a wide dark band on the hindwing typical of adults.

Juveniles (Fig. 11) differ from adults in having a warm buff suffusion over the breast and thighs on otherwise creamy white underparts, as well as less extensive brown streaking, this being concentrated on the lower breast and breast-sides; the belly itself has barely any streaking and there is only sparse spotting on the thighs. The underwing-coverts are creamy white with a warmer suffusion on the forewing-coverts, which are finely streaked brown; the greater coverts are coarsely streaked brown, creating a diffuse band that extends into a much-reduced dark surround to the carpal patch, compared to the adult. The primaries and

TABLE 2

Range of measurements (in mm) of adult *Buteo* taxa, with means (where recorded) in parentheses: *B. socotraensis* and *B.* (*b.*) *bannermani* from NHM specimens (taken by GMK; for protocols see Table 1); all other taxa from Brown *et al.* (1982). The small sample sizes of *B. socotraensis* and *B.* (*b.*) *bannermani* must be kept in mind.

Taxon	Wing length (flattened chord from shoulder to tip)	Tail length (from base of central rectrices to tip)	Tarsus length (from notch on heel to lower edge of last complete scale before toes diverge)
B. socotraensis (*n* = 2,♂♀)	350–366 (*m* = 358)	188–189 (*m* = 188.5)	64.36–66.05 (*m* = 65.19)
B. (*o.*) *oreophilus* (♂♂)	332–336	174–183	61–72 (♂♀)
B. (*o.*) *oreophilus* (♀♀)	345–356	180–196	–
B. (*o.*) *trizonatus* (♂♂)	318–352	–	–
B. (*o.*) *trizonatus* (♀♀)	330–362	–	–
B. b. buteo (♂♂)	350–418	194–223	69–83 (♂♀)
B. b. buteo (♀♀)	374–432	193–236	–
B. b. vulpinus (♂♂)	338–387 (*m* = 359)	170–207 (*m* = 185)	69–82 (♂♀)
B. b. vulpinus (♀♀)	352–400 (*m* = 374)	175–209 (*m* = 191)	–
B. (*b.*) *bannermani* (*n* = 2♀♀)	367–385 (*m* = 376)	177–194 (*m* = 185.5)	74–75 (*m* = 74.5)
B. rufinus (♂♂)	418–447 (*m* = 436.6)	224–240 (*m* = 231.7)	83–92 (*m* = 85.9)
B. rufinus (♀♀)	450–487 (*m* = 462.1)	240–289 (*m* = 261.2)	86–95 (*m* = 89.8)
B. r. cirtensis (♂♂)	345–384	188–197	72–78
B. r. cirtensis (♀♀)	380–425	196–201	74–79

TABLE 3
Morphological characters useful in separating adults of the key *Buteo* taxa covered in this paper, based on specimen analysis supplemented by reference to literature (e.g. Ferguson-Lees & Christie 2001, 2005), especially for *B. oreophilus trizonatus* (James 1986, Clark 2007), and field photographs, especially for *B.* (*b.*) *bannermani*.

Character → Taxon ↓	Overall structure	Tail pattern	Pale panel in upperwing	Breast pattern	Dark carpal patch on the underwing
***B. socotraensis* (sedentary)**	small to mid-sized, with relatively short, compact wings	pale greyish, often with a gingery hue, and 10–12 narrow, dark bands; subterminal broadest	+	no pale horseshoe	usually solid and dark brown, contrasting rather strongly with the coverts, but less so than in *B. rufinus*
***B. o. oreophilus* (sedentary)**	generally smaller than *B. buteo vulpinus*, with shorter and narrower wings and tail	olive-brown to pale brown with 6–7 black bands of equal width to the pale bands	–	no pale horseshoe	dark brown and relatively solid, but contrasting little with underwing-coverts
***B. o. trizonatus* (largely sedentary)**	similar to *B. o. oreophilus*, but reported to be even narrower-winged than the latter with a less rounded wingtip (Clark 2007)	brown washed rufous, either with many narrow dark brown bands (subterminal broadest) or vague dark bands and a clear dark subterminal band	+	pale horseshoe, except very palest birds	dark comma-shaped mark, most of carpal patch is pale
***B. buteo vulpinus* (migratory)**	typically appears relatively compact with broad wings and a rather short tail	cream-coloured to greyish, with many vague dark bands, and the subterminal band broadest and darkest	variable	pale horseshoe sometimes present, but in paler morphs only	dark to blackish comma-shaped mark does not contrast strongly with coverts
***B. b. bannermani* (resident)**	structurally similar to *B. b. vulpinus*	greyish, with 8–11 dark bands of equal width to the pale bands (including the subterminal band at least on the uppertail), but less grey than in *socotraensis*	–	pale horseshoe is apparently always present and usually obvious	dark brown to blackish, but seems rather diffuse and small, and offers little contrast with the coverts
***B. rufinus* (resident and migratory)**	relatively large, with long, broad wings, and a long tail	typically orange-coloured and unbarred or virtually so	+	entire breast and throat usually paler than rest of underparts	usually solid black and very prominent, contrasting strongly with the rufous underwing-coverts

secondaries are off-white, narrowly barred darker (more obvious than in the adult) with a broad dark terminal band, but never as broad or clearly defined as in adults. As shown in Fig. 12, juveniles possess narrow orange-buff fringes to the wing-coverts and an orange-buff suffusion to the cheeks, supercilium and nape. In flight, the juvenile lacks the pale panel at the base of the primaries, the wings appearing all brown.

Variation in the series.—The juveniles (NHM 99.8.11.11 and 1934.8.12.3) differ from the adult in having creamy-white underparts, heavily suffused Warm Buff (118), especially on the breast and thighs, (this suffusion gradually fading with age). Ventrally, the dark streaking, between Burnt Umber (22) and Raw Umber (23) is less extensive than on the adult holotype and is concentrated on the lower breast and breast-sides; the belly has barely any streaking and only sparse, diamond-shaped spotting on the thighs. Undertail-coverts unmarked. The underwing-coverts are predominately Warm Buff (118) with irregular dark markings and a diffuse band across the greater coverts. The dark carpal patch (again Burnt Umber) is greatly reduced. Primaries and secondaries off-white, becoming whiter with age, narrowly barred darker and with a broad dark terminal band. Primary tips Burnt Umber (22). Compared to adults the dark carpal-patch is greatly reduced, the underwing-coverts are much paler with a dark band on the greater coverts, and the barring on the secondaries is more obvious.

Based on our field observations (see Diagnosis), it is clear that there is little variation in either adult or juvenile plumage, apart from the degree and intensity of streaking on the underparts. This ranges from lightly streaked to more heavily so, but most adults conform to the patterns shown in Figs. 5 and 7, and juveniles to that in Fig. 11. The base colour of the tail can vary slightly, with some birds possessing a gingery hue, which can be accentuated when backlit. *B. socotraensis* appears to be less variable in plumage than either *B. buteo* and *B. oreophilus* and probably *B.* (*b.*) *bannermani*.

Distribution and population size.—*B. socotraensis* is found only on the main island of Socotra (Fig. 13), where it is a widespread, but not common, resident breeder. Surveys undertaken between 1999 and 2008 suggest that the population is <250 pairs (Porter & Suleiman in prep.). There is no evidence of any movement away from Socotra, doubtless because of the long sea crossing (>100 km from the closest part of Somalia, Cape Guardafui, and *c*.380 km south of the Yemen coast) that such soaring birds typically avoid. Indeed, migrant broad-winged raptor species are vagrants to Socotra. There is just one definite record of Steppe Buzzard *B. buteo vulpinus* (a dark-morph individual on 26 November 1999: RFP pers. obs.), which is the commonest migrant bird of prey in Arabia (Shirihai *et al*. 2000) and was immediately recognised as distinct from the resident Socotra buzzards. There are too few historical data to determine whether there has been any change in the status or population of the Socotra Buzzard since the first ornithological visits to the island in the 1880s. It is probably the rarest of the island's endemic birds and detailed studies of its population and ecology are urgently required.

Habitat.—Socotra Buzzard is resident in the foothills and plateaux, mostly where there are deep ravines, from sea level to at least 1,370 m, but principally at 150–800 m. It does not appear to be dependent on trees, but steep cliffs would seem to be prerequisite for nesting (RFP pers. obs.). No seasonal altitudinal movements have been observed, and it is reasonable to assume that if there are any, they are not significant. Competition for nesting sites has not been studied, but with Egyptian Vulture *Neophron percnopterus*, Peregrine Falcon *Falco peregrinus* and Brown-necked Raven *Corvus ruficollis* all using similar cliff-ledges for nesting on Socotra, this might be a limiting factor to the buzzard population. This could be especially true with respect to Egyptian Vulture as Socotra probably holds the highest concentration of this species in the world, with a population of *c*.1,700 individuals (Porter & Suleiman in prep.).

Behaviour.—Similar to other Old World *Buteo* species, especially to that of Common *B. b. buteo* and Steppe Buzzards *B. b. vulpinus*. Much time is spent perched on rocks, cliff ledges, trees and bushes, which are presumably used as scanning posts to search for food. In all months, birds have been observed soaring high above plains and hills, sometimes in loose groups of up to five, often with spells of calling. In this respect behaviour is similar to that of *B. b. buteo* and *B. b. vulpinus*. During a total of 25 weeks of observation (spanning seven months in nine years) RFP has never observed *socotraensis* hovering.

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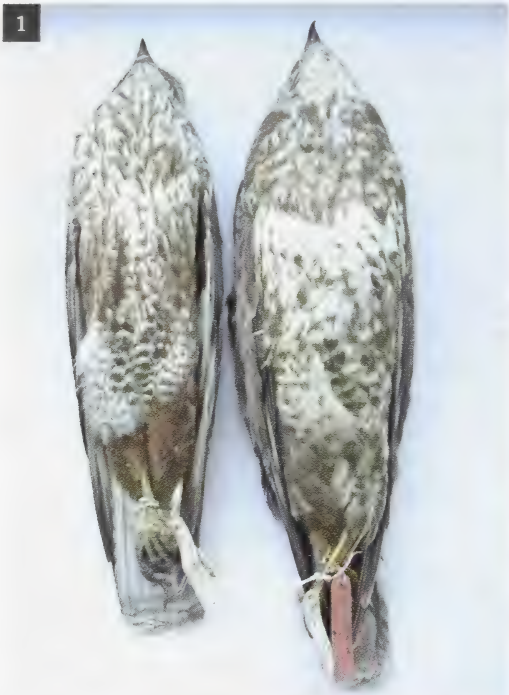

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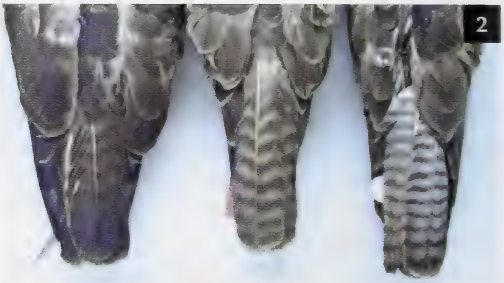

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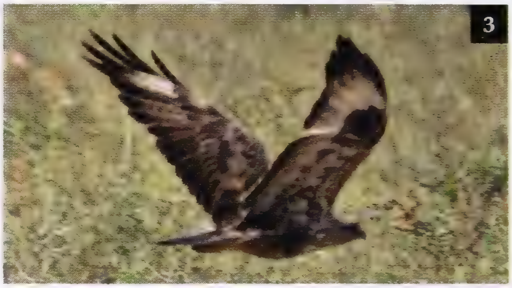

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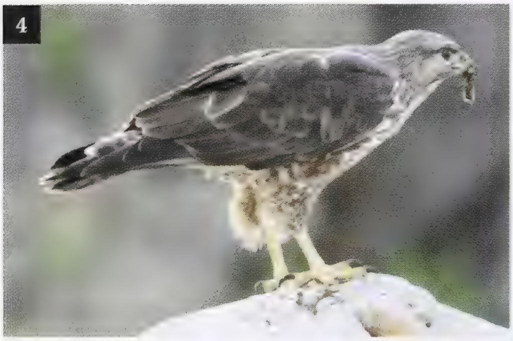

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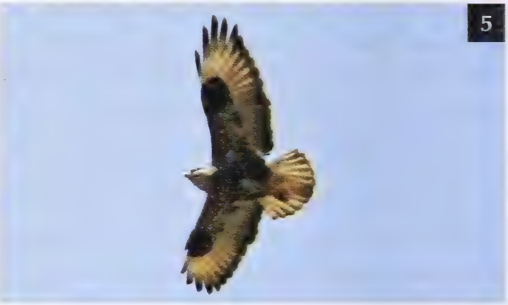

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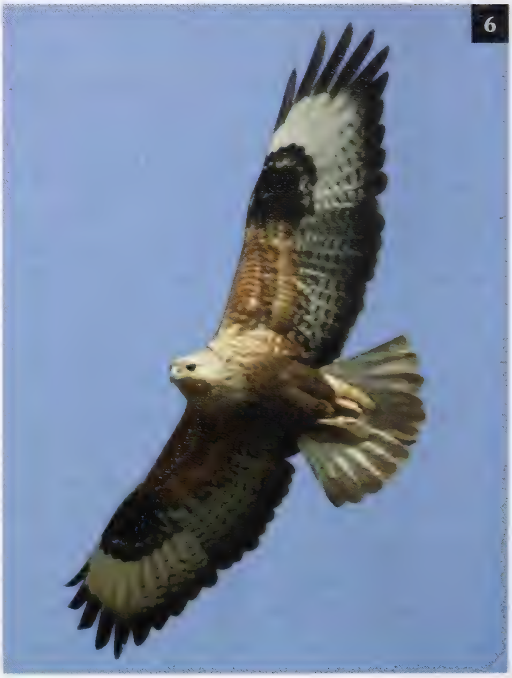

Figure 1. Unsexed adult holotype Socotra Buzzard *Buteo socotraensis* (left; NHM 99.8.11.10) and female holotype of Cape Verde Buzzard *B.* (*buteo*) *bannermani* (NHM 1919.8.15.148), held in The Natural History Museum, Tring (R. F. Porter / © The Natural History Museum, Tring)

Figure 2. Uppertail patterns of Mountain Buzzard *Buteo oreophilus* (left), Cape Verde Buzzard *B. bannermani* (centre) and Socotra Buzzard *B. socotraensis* (R. F. Porter / © The Natural History Museum, Tring)

Figure 3. Adult Socotra Buzzard *Buteo socotraensis*, Socotra, 18 February 2006 (R. F. Porter)

Figure 4. Adult Socotra Buzzard *Buteo socotraensis*, Socotra, with centipede, probably *Scolopendra balfouri*, November 2008 (R. F. Porter)

Figure 5. Adult Socotra Buzzard *Buteo socotraensis*, Socotra, October 2007 (R. F. Porter)

Figure 6. Adult Long-legged Buzzard *Buteo rufinus*, Iraq, date unknown (A. F. Omar / Nature Iraq)

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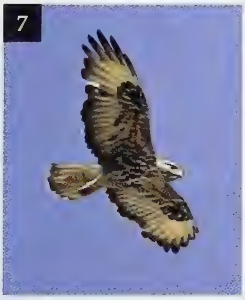

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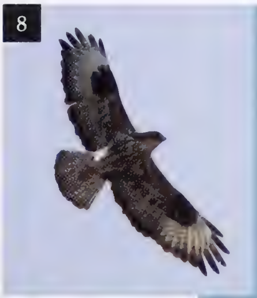

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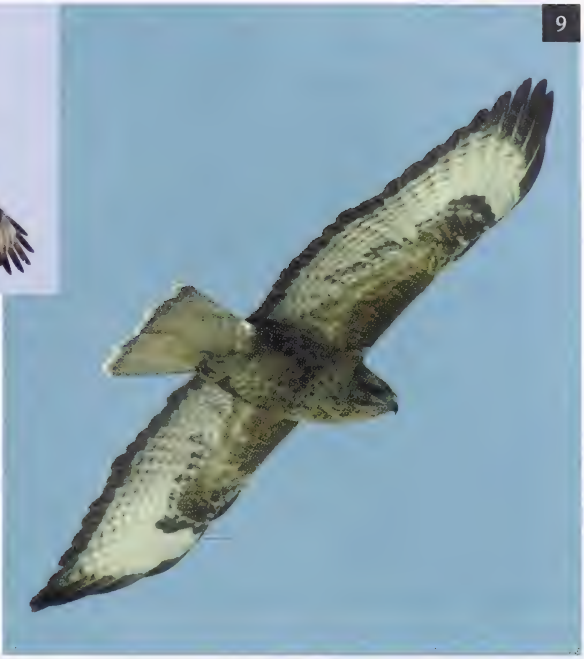

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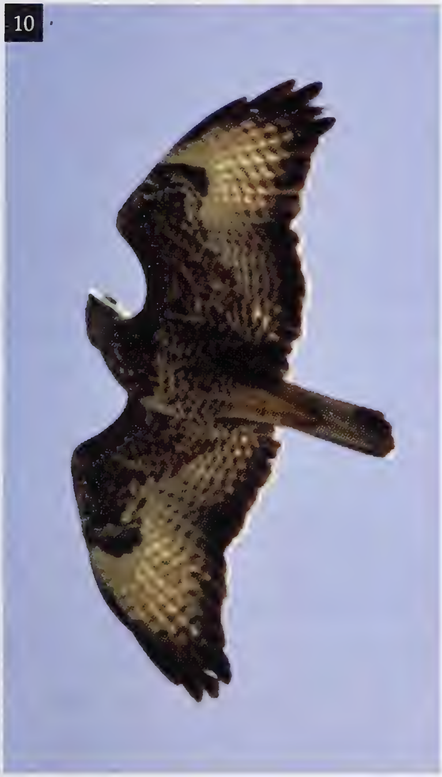

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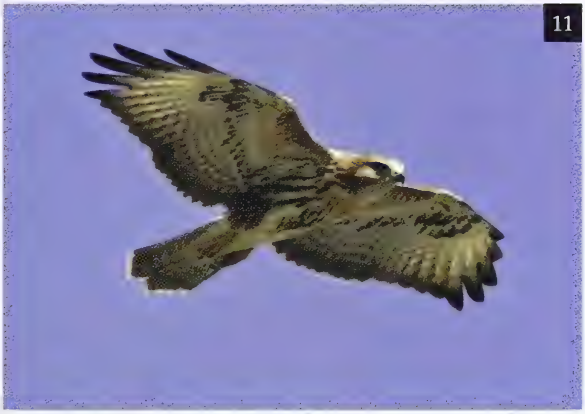

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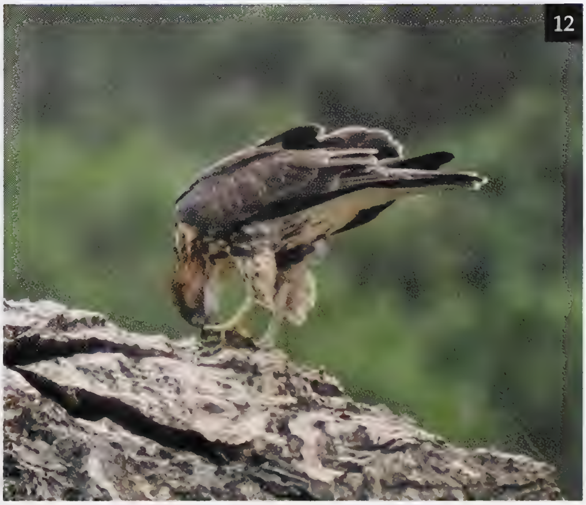

Figure 7. Adult Socotra Buzzard *Buteo socotraensis*, in wing moult, Socotra, October 2007 (R. F. Porter)

Figure 8. Adult Socotra Buzzard *Buteo socotraensis*, Socotra, January 2006 (Hanne & Jens Eriksen)

Figure 9. Adult Steppe Buzzard *Buteo buteo vulpinus*, southern Israel, March 1989 (Paul Doherty)

Figure 10. Cape Verde Buzzard *Buteo (buteo) bannermani*, Cape Verde Islands, date unknown (Vaughan Ashby)

Figure 11. Juvenile Socotra Buzzard, *Buteo socotraensis*, Socotra, 28 February 2007 (R. F. Porter)

Figure 12. Juvenile Socotra Buzzard, *Buteo socotraensis*, Socotra, 12 February 2004 (R. F. Porter)

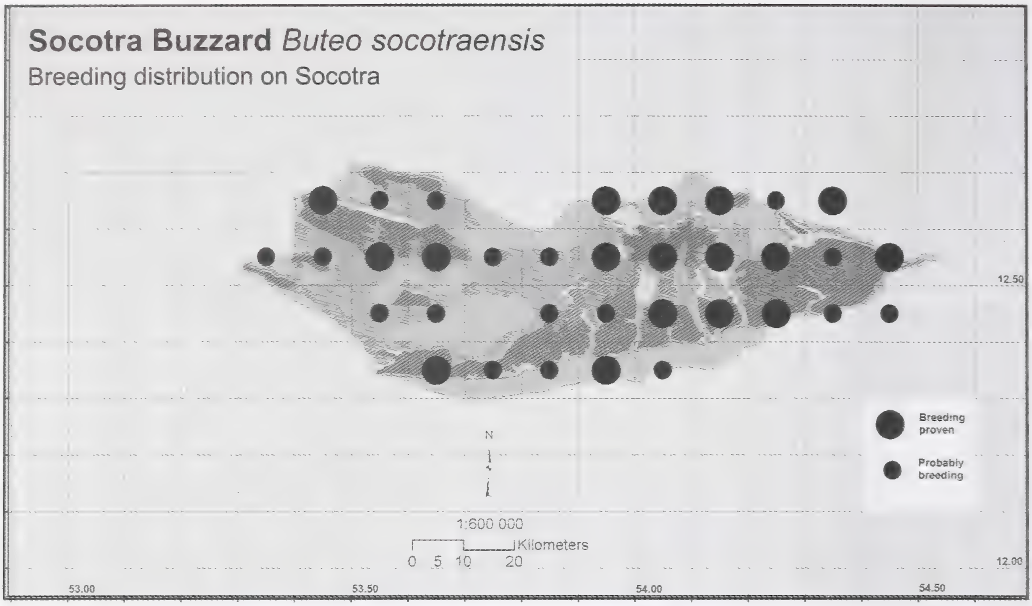

Figure 13. Socotra Buzzard *Buteo socotraensis* breeding distribution on Socotra (Socotra Conservation and Development Programme / BirdLife International)

Breeding.—Data presented here are summarised from Porter & Jennings (in press). Display, notably aerial tumbling and talon grappling, has been observed in October–December and February, and copulation in November. Nest building has been observed in late October and a nest with a chick (*c*.15 days old), being tended by both adults, was found on 28 October; in this case egg laying would have been in mid September. A nest with two eggs was found on 16 November (egg dimensions were presented by Clouet *et al*. 1998), and nests with young observed in January (young *c*.1 month old) and in early April, to which adults were bringing food. A juvenile in captivity on 2 March was just a few weeks out of the nest, suggesting egg laying in January; discussions with the 'owners' of three other captive juveniles suggested laying dates in October–January. Two other juveniles in captivity had apparently been taken from a nest in November, thus indicating egg laying commences in October. One instance of a pair nest building in April and May was not followed by egg laying. Fully-fledged young, still with a strong parental bond, have been observed from mid February to early April. All the above observations suggest that the breeding season extends from September–April (perhaps into May), with egg laying in September–January. It is probably important for this buzzard to have completed its breeding cycle before the onset of the monsoon winds in late May, which could hamper its ability to hunt and find food for the young. Broods of only one or two nestlings have been recorded on single occasions, but there is one record of a pair with three fledged young, indicating that clutch size can be larger. The few nests observed have been constructed of sticks on a cliff-ledge or crevice, sometimes with a tree, small bush or vegetation for protection or support. Live branches with leaves have been observed being brought to the nest. No tree nests have been reported. Once a pair appeared to be preparing to breed again in the previous season's nest (Clouet *et al*. 1994). Nests have been noted at 150–650 m. It was suggested by Clouet *et al*. (1994) that nests might be sited to provide shade during the day. Whilst there is no information on the role of the sexes in nest building or incubation, both have been observed tending young in the nest and are present during the post-fledging period. There is a record of repeated attacks on an Egyptian Vulture by a pair of buzzards, when their nest was approached, and another observer reported an adult becoming agitated by a Peregrine Falcon near a possible cliff nest site.

Food.—Diet almost certainly exclusively comprises reptiles and invertebrates. Individuals are often seen perched on a prominent rock or tree, and the method of foraging appears to be to wait for prey to come into range and then pounce. However, there is no detailed information on the diet of either adults or juveniles, but food being taken and consumed has included a snake, small lizard, locusts, at least once a large centipede (probably *Scolopendra balfouri*) and a large caterpillar (RFP). This 'passive' hunting method is not effective for catching birds. The centipedes in question reach up to 18 cm long and, together with the larger crabs, are the largest terrestrial invertebrates on the island. The head is poisonous and the tail has two pincers, both of which were, in the case observed, apparently removed and discarded by the buzzard. Socotra has a very depauperate mammalian fauna (Cheung & DeVantier 2006), consisting of one tiny shrew, four bats, and two human commensal rodents, House Mouse *Mus musculus* and Black Rat *Rattus rattus*, both of which are found near settlements, where this buzzard rarely occurs. As the rodents are thought to be historically recent arrivals on the island, it has been assumed that the bulk of the buzzard's prey must be lizards, large insects and possibly nestlings; the birds have never been observed feeding on carrion. Clarification of its diet will be an important factor in guaranteeing its survival.

Moult.—Adults in active wing moult have been observed in November–April. By February–March most adults observed had recently moulted their primaries, thus most have freshly moulted flight feathers during the period when most juveniles are fledging. This differs from the moult sequence typical of *B. b. buteo*, which does not commence primary and tail moult until late April / early May, or *B. b. vulpinus*, which commences moulting both the primaries and tail in early May (see Cramp & Simmons 1980, Martins & Porter 1996). However, it must be remarked that in widespread species, differences in moult timing can be expected in different regions and we have attached no taxonomic significance to these differences.

Vocalisations.—The calls of *Buteo rufinus*, *B. buteo*, *B. oreophilus* (*sensu stricto*) and *B. socotraensis* are very similar. Sound-recordings of *socotraensis* were made in 1999–2004 but only one could be assigned to an adult, made in November, which is at the start of the breeding season. Although it transpired that this recording was distorted, it was nevertheless compared with the calls of known adults of the other taxa. Because of the distortion and the small sample (n=1), this brief analysis should be treated as highly provisional. It is included to encourage further study and has not been used in the taxonomic assessment of the Socotra Buzzard. Sonogram comparisons suggest the inter-note intervals in *oreophilus* and *rufinus* are very similar, with longer gaps between calls (*c*.5 seconds in the former vs. *c*.3.5 seconds in the latter), whereas such intervals in *buteo* (*c*.1–2 seconds) and *socotraensis* (<1 second) are considerably shorter. Note structure differs between all four taxa, but again *socotraensis* with its much less wavering form is perhaps most similar to *B. buteo*, although it should be added that the latter's note structure is still closer to either *oreophilus* or *rufinus* than to *socotraensis*. Of the four taxa sampled *socotraensis* shows the smallest frequency range, its calls being almost entirely concentrated at around 2.2 kHz, especially compared to *oreophilus* (total range *c*.1–6 kHz) and *rufinus* (*c*.1–4 kHz), although all four, including *B. buteo*, show the same emphasis around *c*.2.0 kHz.

Etymology.—We have employed the name *socotraensis* to reflect the provenance of this new taxon, but have intentionally formed it as an arbitrary combination of letters in the form of a word to ensure that its spelling remains fixed (ICZN 1999, Arts. 11.3, 26 and 31.2.3). The English name 'Socotra Buzzard' agrees with the recommendation of the IOC (Gill & Wright 2006) that noun usage, because it is already established for other birds endemic to the island group, e.g. Socotra Bunting *Emberiza socotrana* and Socotra Sparrow *Passer insularis*, should be preferred over an alternative adjectival form, in this case Socotran.

Taxonomic rank.—As noted in the introductory paragraphs, various authors have wrestled with the taxonomic position of the Socotra Buzzard. Indeed, it might be stated, with no pretence to originality, that in the Palearctic region the problems posed by Old World *Buteo* in general are amongst the thorniest in avian taxonomy. The results of two genetic studies, although sampling only non-nuclear DNA, have suggested that the insular populations of the Cape Verde Islands and Socotra are most closely related to *Buteo rufinus*, a taxon that has been universally accorded specific rank in all recent literature. Three options therefore are open: (i) to treat all three as members of a single species; (ii) to recognise two, mainland and insular, species; and (iii) to recognise three species. In all three cases, the genetic, morphological and morphometric evidence combined, presented herein and in the papers discussed in the introduction, clearly indicate that Socotra Buzzard is a discrete taxon, and needs to be named under the articles of the Code. We agree with Kruckenhauser *et al.* (2004) that, to some extent, the taxonomic rank given to that name is a matter of personal preference. However, even for those working within the constraints of the Biological Species Concept, we do not consider it to be a reasonable option to treat Socotran birds as conspecific or consubspecific with the Cape Verdes buzzard, *bannermani* because of their level of morphological differentiation and widely disjunct ranges which prohibit genetic interchange.

Nonetheless, one of the authors of this latter study, A. Gamauf (*in litt.* 2009) has pointed out that the genetic data available for Socotran buzzards suggest that they do not form a monophyletic group with *bannermani*, and are of separate origin. In her opinion, it cannot be excluded that they represent a stabilised hybrid population between ancestral *B. rufinus* and *B. b. vulpinus*. The geographic position of Socotra (and the Cape Verde Islands) at the border of the migration routes and winter quarters of these highly mobile raptors does need to be considered. Additional genetic data for both these insular populations are certainly required to reach more robust conclusions concerning their phylogeographic history.

Despite the notable lack of genetic differentiation amongst Old World *Buteo* in general (Kruckenhauser *et al.* 2004, Lerner *et al.* 2008), and even though they are now understood to be a relatively youthful radiation arriving from the New World perhaps via a single dispersal event (Griffiths *et al.* 2007, Amaral *et al.* 2009), recent workers have taken an increasingly expansive view of *Buteo* taxonomy in Afro-Eurasia. Given that Socotra became separated from surrounding landmasses at least 31 MYA (Braithwaite 1987), the colonising proto-*Buteo* population must have arrived over water.

In line with Helbig *et al.*'s (2002) recommendation that decisions on species limits among allopatric taxa be guided by comparisons with degrees of difference in sympatric taxa that behave as species, we offer the following remarks. As long ago as the 1950s, when all of the relevant taxa were generally considered subspecies of *B. buteo*, Rudebeck (1958) had already briefly mooted the possibility that *B. oreophilus* (Mountain Buzzard) and *B. trizonatus* (Forest Buzzard) might be better treated as separate species, rather than subspecies. It was a supposition given a more thorough review by James (1986), even though Dowsett & Dowsett-Lemaire (1993) cited James's reticence to 'split' as part of their rationale for maintaining one species. Clark (2007) further supported Rudebeck's view based on his field and museum observations of differences in plumage and wing shape. According to Kruckenhauser *et al.* (2004) these two taxa are not monophyletic.

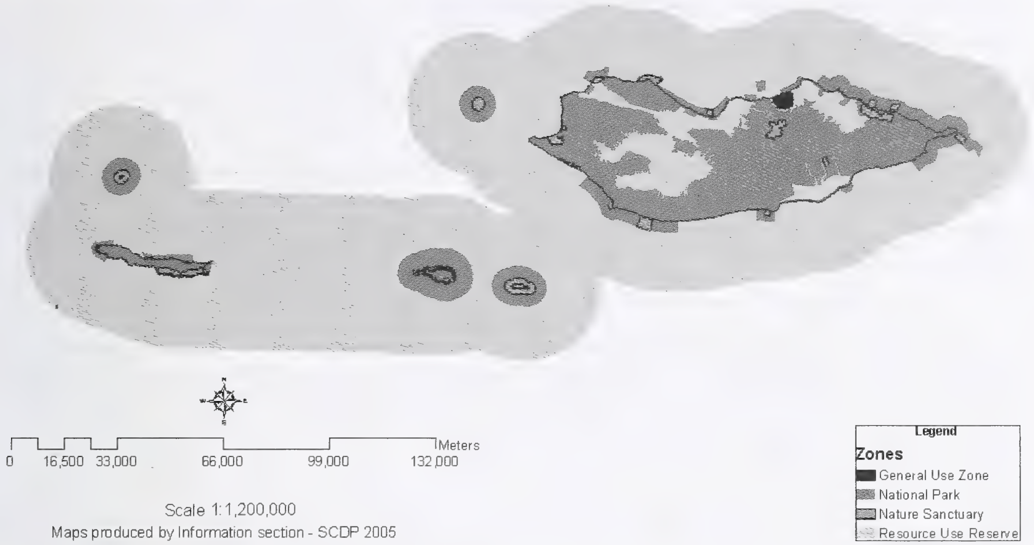

Figure 14. Terrestrial nature reserves and national parks on Socotra created by the government of Yemen in 2000 under the Zoning Plan.

Brooke (1975) then concluded that *Buteo rufofuscus* (Jackal Buzzard) and *B. augur* (Augur Buzzard) are separate species, and although Brown *et al.* (1982) treated them as conspecific, Brooke's view has now been universally adopted. Thus, authors as diverse as Prigogine (1984), James (1986), Sibley & Monroe (1990), Short *et al.* (1990), Dowsett & Dowsett-Lemaire (1993), Kemp (1994), Ferguson-Lees & Christie (2001) and Dickinson (2003) all treated *augur* as a separate species, despite a lack of molecular data at the time to support or dispute this supposition. Incidentally, Amaral *et al.* (2009) recently demonstrated the two to be only very marginally separated genetically. Indeed, recently published mitochondrial and nuclear gene data for *rufofuscus* and *augur* demonstrate them to be firmly nestled within the same clade of Old World buzzards as *B. buteo*, *B. oreophilus* and *B. rufinus*, close to the latter (Lerner *et al.* 2008, Amaral *et al.* 2009), despite dissimilarities in plumage. In this respect, Siegfried's (1970) suggestion that *rufofuscus* might be allied to Palearctic stock represented by *rufinus* appears far-sighted.

In the light of these examples, we consider that the Socotra Buzzard should also be treated as a full species. Its position is unique: genetically it is closest to *rufinus* and *bannermani*, but in plumage nearer to *trizonatus* / *oreophilus* and to a lesser extent *vulpinus*, whilst mensurally it resembles other short-winged taxa, especially *bannermani*.

Conservation.—Given the species' overall small population, probably numbering <1,000 individuals (see Distribution and population size), it seems that *socotraensis* would be accorded the IUCN category of Vulnerable, under criterion D1 (very small population), should the taxon be recognised specifically by BirdLife International. There is no evidence of a decline at present, but should a decrease in numbers become apparent in the future this could trigger its upgrading to a higher threat category. Buzzards are not infrequently taken from the nest in the mistaken belief that they can be sold into the falconry trade. Such birds end up being retained in captivity on the island. How many are taken is unknown, nor is the impact of this activity on the bird's population. However, because of the rarity of this buzzard, any such theft from the wild must be actively discouraged. In this respect, the recent laws governing the removal of biological material from the island should have the effect of diminishing the number of birds taken in future, as these laws will impact the demand for falcons and thus other raptors. Enforcement of laws to prevent the taking of young birds from nests is the highest priority. The terrestrial nature reserves and national parks created by the government of Yemen in 2000 under the Zoning Plan (Ministerial Decree no. 275) encompass *c*.75% of the total area of the island (Fig. 14). These protect all the major vegetation types and areas of greatest importance for flora and fauna. Comparing the distribution map for Socotra Buzzard (Fig. 13) and those areas protected under the Zoning Plan reveals there is a legal framework to protect its main breeding and feeding areas within this recently designated World Heritage Site. The enforcement of the Zoning Plan is therefore essential not only for the buzzard but for the other Socotra endemics.

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First observations at sea of Vanuatu Petrel *Pterodroma (cervicalis) occulta*

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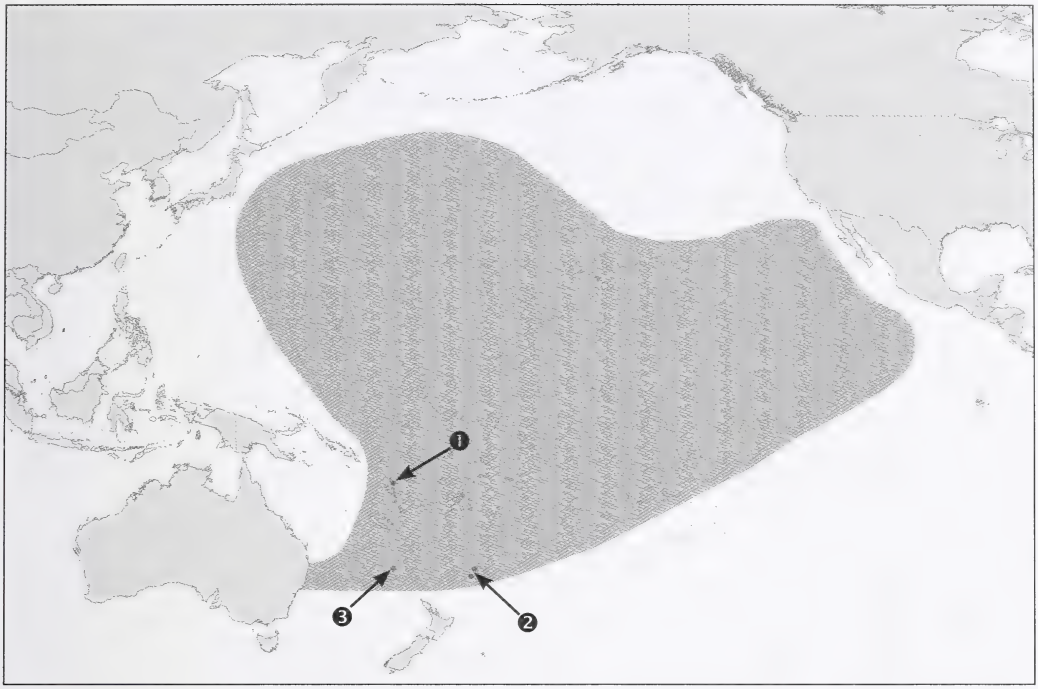
Summary.—We present the first observations at sea of Vanuatu Petrel *Pterodroma (cervicalis) occulta*, as well as briefly reviewing the history of this poorly known seabird. A comprehensive review of the field characters of Vanuatu Petrel is provided, along with a discussion of its relative size differentiation from White-necked Petrel *P. cervicalis*. The feeding behaviour of this petrel is described, and suggested ways of finding this rare petrel at sea—off one of the most remote tropical Pacific islands—are also given.

In recent years, pelagic trips have led to repeated rediscoveries of long-lost taxa, e.g. New Zealand Storm Petrel *Oceanites maoriana* (Saville *et al.* 2003) and Beck's Petrel *Pseudobulweria becki* (Shirihai 2008), and have also yielded the first documented at-sea observations of Fiji Petrel *P. macgillivrayi* (Shirihai *et al.* 2009). The same is now true for Vanuatu Petrel *Pterodroma (cervicalis) occulta*, which was initially collected by Rollo Beck during the Whitney South Sea Expedition, on 28–29 January 1927, off the Banks Islands, Vanuatu. Six specimens, now held in the American Museum of Natural History (AMNH), New York, were taken 30 nautical miles east of the Banks archipelago. For almost 60 years, due to taxonomic uncertainty and the undetected differences between Juan Fernández *P. externa* and White-necked Petrels *P. cervicalis*, these specimens were labelled *P. externa*. Subsequently, they were referred to the smaller *P. cervicalis* (Falla 1976). Recently, Imber & Tennyson (2001) elected to describe these distinctly smaller specimens as a new species. However, R. C. Murphy, in an unpublished manuscript, was first to postulate that the Vanuatu birds might represent something 'new', and in 1962 Bill Bourne planned to name them as a subspecies for Robert (later Sir Robert) Falla, but was unable to complete his idea (W. R. P. Bourne *in litt.* 2010).

The first sign that Vanuatu Petrel was still extant came when a specimen was found (apparently roadkilled) in eastern Australia in April 1983 (Boles *et al.* 1985). The specimen is held in the Sydney museum (examined by VB). Boles *et al.* (1985) correctly assigned the specimen to the smaller form of White-necked Petrel from Vanuatu by matching its size with the AMNH specimens.

As part of our ongoing tubenoses project (Shirihai & Bretagnolle in prep.) we have visited New Caledonian and southern Vanuatu waters on several occasions since December 2005. On 2 January 2006, between New Caledonia and Vanuatu (20°16′24.73″S, 168°10′39.69″E), a single Vanuatu Petrel was seen. On 29 January 2007, two (possibly three) birds were again seen off southern Vanuatu (19°27′20.80″S, 168°28′19.36″E). They were tentatively identified as Vanuatu Petrel based on their apparently relatively smaller size, in side-by-side comparisons with Tahiti Petrel *Pseudobulweria rostrata*, and more solidly black tips to the underwing. Furthermore, in January 2006, HS visited the Kermadec Islands to study variation in White-necked Petrels (see below). These records provided indirect evidence that a breeding population of Vanuatu Petrel existed somewhere, probably in Vanuatu. Because no documentation was obtained, these records were not published, and we elected to obtain new evidence in Vanuatu in December 2009, when a special expedition



Distribution of *Pterodroma cervicalis* as given for White-necked *P. cervicalis* and Vanuatu Petrels *P.* (*c.*) *occulta* combined, with the numbered arrows indicating the three breeding grounds: (1) on Vanua Lava, Banks Islands, Vanuatu, where Vanuatu Petrel breeds (population unknown, but possibly a few tens to a few 100s of pairs); the main breeding island of White-necked Petrel on (2) Macauley Island, Kermadec Islands (with *c.*50,000 pairs in 1988, possibly increasing); and the second small colony on (3) Phillip Island, off Norfolk Island (a few pairs only). Migrates to the North Pacific Ocean with the estimated range shown. (Adapted from the BirdLife International species factsheet online at www.birdlife.org, based on Marchant & Higgins 1990, Imber & Tennyson 2001 and Totterman 2009.)

to study Vanuatu Petrel was arranged. During this visit (to the Banks Islands) we obtained 43 sightings of Vanuatu Petrel on 25–27 December, and 14 individuals were photographed; the first photographically documented records of this poorly known species at sea.

In February 2009, Totterman (2009) located the species' breeding area atop a volcanic cone on the east side of Vanua Lava island, in the Banks group. This breeding colony was well known to the islanders, especially those from Vanua Lava and the nearby Mota Lava Islands, who formerly harvested the fledglings in the burrows. VB visited this colony in December 2009.

Finally, on 7–9 February 2010, P. Harrison recorded 21 Vanuatu Petrels off northern Vanuatu (during a voyage between New Zealand and Papua New Guinea); some of these were photographed and can be seen on the Zegrahm Expeditions website (www.zeco.com).

Although some sources already consider Vanuatu and White-necked Petrels as separate species (e.g. Onley and Scofield 2007), it should be mentioned that neither Brooke (2004) nor BirdLife International (www.birdlife.org/datazone/species/index.html) recognises *P. occulta* specifically. For now, we prefer to complete our own genetic and acoustic work on this matter before commenting on the taxonomy of Vanuatu Petrel.

Vanuatu Petrel is virtually unknown to science, but birders and researchers are increasingly seeking information as to its separation from White-necked Petrel. Here, we

TABLE 1

Comparison of measurements (specimens from breeding islands only; AMNH and Australian Museum at Sydney) of Vanuatu *Pterodroma* (*cervicalis*) *occulta* and White-necked Petrels *P. cervicalis*. Note overlap in extreme values in all measurements except bill height at hook. Tail is longer in Vanuatu in relation to wing. Bill size appears to be the best separating character, but this is very difficult to appreciate in the field. Although sample sizes are small, there are statistical differences but overlap in extreme values (even in wing).

	Wing				Tail				Tarsus			
	Mean	SD	Min.	Max.	Mean	SD	Min.	Max.	Mean	SD	Min.	Max.
P. cervicalis (*n*=22)	303.45	6.12	292.0	315.0	126.27	5.68	117.00	137.00	39.76	1.27	37.6	42.7
P.* (*c.*) *occulta (*n*=5)	288.4	4.8	281.0	294.0	124.2	8.17	117.00	137.00	36.21	1.66	33.9	37.9
	Culmen				Bill height				Bill width			
	Mean	SD	Min.	Max.	Mean	SD	Min.	Max.	Mean	SD	Min.	Max.
P. cervicalis (*n*=22)	35.60	1.16	33.5	37.30	13.14	0.50	12.3	14.30	17.17	0.79	15.4	18.5
P.* (*c.*) *occulta (*n*=5)	32.17	1.07	31.0	33.75	11.40	0.77	10.1	12.10	14.58	0.90	13.6	15.8

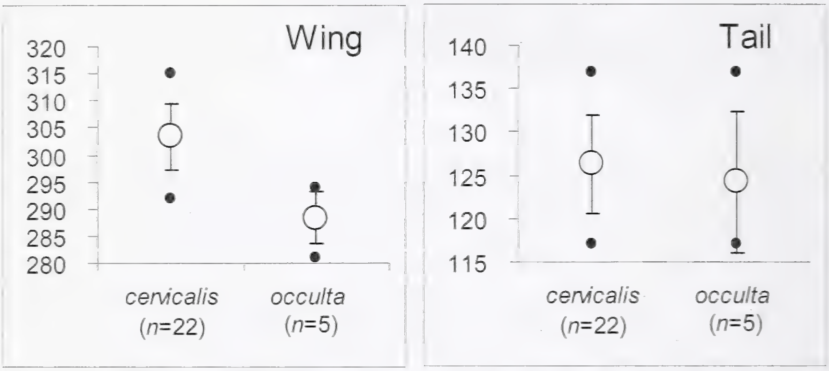


Figure 1. Biometrics of Vanuatu Petrel *Pterodroma* (*cervicalis*) *occulta* (based on four of the six AMNH specimens and that held at the Australian Museum, Sydney) and White-necked Petrel *P. cervicalis* (AMNH specimens). Data shown are means (empty circles), SD (vertical bars) and extreme values (black dots). Note that wing length differs (although there is some overlap), whilst tail length is closer matched.

will focus on the differences between the two forms at sea and discuss their separation. We also utilise specimen data, based on our examination of the six individuals at AMNH, as well as the Australian bird, completed by studies of White-necked Petrels at several major museums.

Identification of Vanuatu Petrel at sea

Vanuatu Petrel is smaller than White-necked Petrel, but virtually identical in plumage (see Imber & Tennyson 2001, Totterman 2009). As such, pelagic identification depends almost exclusively on a correct evaluation of size, and to a lesser extent of underwing pattern. These characters and their reliability are now discussed.

Size and proportion.—At sea, the overall impression is that, on average, Vanuatu Petrel is at most *c*.10% smaller (but usually much less) and slighter than White-necked Petrel. Published biometrics (Imber & Tennyson 2001) and our own data (Table 1) suggest that there is little overlap between them, but this depends on the character investigated. Our biometric data (Fig. 1) suggest that Vanuatu Petrel is smaller only by *c*.5% in wing length and *c*.2% in tail length than White-necked Petrel (8% and 9%, respectively, in Imber

TABLE 2

Comparison of the amount of white on the exposed primary bases and inner webs of the underwing in White-necked *Pterodroma cervicalis* (from the Kermadec Islands) and Vanuatu Petrels *P.* (*c.*) *occulta* (from Mota and Vanua Lava, Banks Islands). Scores for plumage characters (mostly underwing) were made by direct observations at sea and by checking images from each individual; to prevent double-counts we studied the photographs to confirm individual identification based on the underwing and head markings, which differ individually. In birds scored 1–2 the exposed white is prominent in the field. The white on birds scored 3 is small but still visible at sea, especially in photographs. On birds scored 4–5 the white is at most very limited (and best seen on photographs) and the wingtip usually looks almost solid black and sharply defined from the white coverts. The latter categories collectively represent 60% of Vanuatu Petrels, but only 9% of White-necked Petrels, while score 2 is very infrequent in Vanuatu Petrel but scores 1–3 account for 71% of White-necked Petrels. No Vanuatu Petrels scoring 1 have been found to date.

Degree of white in primaries →	Score 1: extreme white	Score 2: substantial white	Score 3: limited white	Score 4: insignificant white	Score 5: no white
P. cervicalis (*n*=120)	26.5%	44.5%	20%	6.5%	2.5%
P. (*c.*) *occulta* (*n*=33)	-	9%	30.5%	39.5%	21%

& Tennyson 2001). Although our biometric data for Vanuatu Petrel are almost identical to those of Imber & Tennyson (2001), there is some discrepancy for *P. cervicalis*, probably related to the age of specimens. Because all our measurements of *P. cervicalis* were taken at AMNH, from birds collected at approximately the same time as Vanuatu Petrel, we feel confident in our data. Based on these, Vanuatu Petrel is proportionately longer tailed than White-necked Petrel, with their wing/tail ratios being 2.3 and 2.4, respectively. Totterman (2009) suggested a 20% difference in wingspan, but his wing measurements were incorrect. Bill dimensions are more diagnostic, with Vanuatu Petrel being 9–15% smaller in length, depth and width, with no overlap in bill height (though the sample is limited). However, these differences appear too subtle for use at sea, meaning that there no clear-cut differences in shape, proportions and jizz useful for field identification. Overall, Vanuatu Petrel is only slightly smaller, but often appears slighter than White-necked Petrel, with some but not all birds appearing longer / slimmer tailed. Concerning size differences, three obstacles must be considered by field observers. *1*: there is much individual size variation in both taxa. The smallest White-necked can appear confusingly small and lighter built than average-sized individuals—thus the species can frequently appear relatively small and slender. In turn, Vanuatu Petrel often looks as large and chunky as White-necked. *2*: the correct evaluation of size differences at sea is realistic only in side-by-side comparisons, or if compared with another familiar petrel species nearby. *3*: sea conditions affect flight mode and hence the impression of overall size and structure (thus jizz), whilst changes in light conditions also exert a strong influence on size appreciation. Our conclusion is that such fine estimates of size at sea (or in photographs) are difficult, and generally impossible to reliably detect.

Underwing pattern.—The two taxa differ by the amount of the white on the exposed primary bases toward the tips (as already suggested by Imber & Tennyson 2001, and tentatively illustrated in Onley & Scofield 2007), with Vanuatu Petrel generally tending to have more restricted white (i.e. more solid black wingtips—see Fig. 2). In contrast, White-necked tends to have a broader white area on the exposed bases and inner webs of the primaries (especially from the second or third outermost primary towards the seventh primary—see Fig. 3). The nature of these differences mirrors the case between two taxa of Cory's Shearwater *Calonectris diomedea* in the Atlantic (Gutiérrez 1998, Howell & Patterson 2008). However, our observations and photographs from the breeding islands of both forms reveal the presence of substantial individual variation in both taxa, and thus significant overlap and intermediate birds, which prevent using this feature as absolutely diagnostic (see Table 2).

Unfortunately, variation in White-necked Petrel includes 9% of birds with extensive black wingtips, like typical Vanuatu Petrels. Fig. 8 shows almost the extreme ends of the spectrum of variation in White-necked Petrel, whilst Fig. 4 shows a Vanuatu Petrel with some white in the primaries (score 3). Evaluating the degree of white in the primaries on the underwing is often made more difficult by the angle of view and wing movements, e.g. if the primaries are held more tightly or more spread out, or the extent of any shade. Fig. 9 demonstrates that even in the same bird or a single image, it is possible to acquire different impressions of this feature, making it essential that multiple photographs of the same bird are evaluated.

In addition, Vanuatu Petrel may tend to have the dark leading edge to the underwing, the diagonal bar and the trailing edge broader and more solidly black than most White-necked Petrels. Again, however, we found considerable individual variation in both forms (and thus complete overlap between them). Nevertheless, in both, there is a tendency for paler birds (or birds with whiter primary bases) to have weaker / narrower dark markings, whilst, on average, darker individuals tend to have broader black linings to the underwing.

Separation by range?—Range maps are presented in Marchant & Higgins (1990, also reproduced by BirdLife International) and Brooke (2004), but these authors lump Vanuatu Petrel under *P. cervicalis*. Brooke (2004) indicated that in the non-breeding season there is a generally broad-front movement to the north-west Pacific. Any dispersal range differences between Vanuatu Petrel and *P. cervicalis* away from the breeding islands are wholly unknown, but study of photographed birds from the western Pacific, including off eastern Australia, clearly suggests that *P. cervicalis* is frequent in these waters, and it is therefore likely that the ranges of the two forms overlap somewhere between Australia and Vanuatu, at least at some seasons. Brooke (2004) estimated the world population of White-necked Petrel (which nests almost exclusively on the Kermadec Islands) at *c*.50,000 pairs, or at least 150,000 birds, though current numbers are apparently even larger. The population of

Legend to figures on opposite page

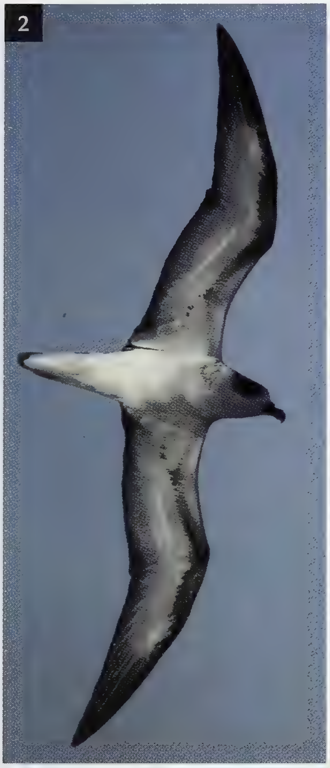
Figure 2. Vanuatu Petrel *Pterodroma* (*cervicalis*) *occulta*, off Mota Lava, Banks Islands, December 2009; note the slightly more spread primaries on the right (top) wing with some white primary bases exposed (Hadoram Shirihai, © Tubenoses Project)

Figure 3. White-necked Petrel *Pterodroma cervicalis*, Kermadec Islands, January 2006, showing obvious white on the bases of the primaries (score 2), which occur in nearly 50% of birds in the Kermadec Islands (see Table 2), but is rare in Vanuatu Petrel *P. occulta* (<10%) (Hadoram Shirihai, © Tubenoses Project)

Figures 4–5. Comparison between Vanuatu Petrel *Pterodroma* (*cervicalis*) *occulta*, off Mota Lava, near Vanua Lava, Banks Islands, December 2009 (left) and White-necked Petrel *P. cervicalis*, Kermadec Islands, January 2006 (right). The two have virtually identical underwing patterns making them impossible to assign to species away from the breeding islands. Both show some white on the primary bases and their inner webs (score 3), with the Vanuatu Petrel showing fractionally more but insufficient to score 2 (see Table 2). Such birds constitute 20% of White-necked Petrels and 30% of Vanuatu Petrels. The smaller bill of Vanuatu Petrel is not apparent when comparing these two images, in which both seem to have the same-sized bill, albeit perhaps even slightly shorter and more slender still in the White-necked Petrel (Hadoram Shirihai, © Tubenoses Project)

Figure 6. White-necked Petrel *Pterodroma cervicalis*, Kermadec Islands, January 2006, showing extensive white on the primary bases (score 1), which type has to date not been found in Vanuatu Petrel *P.* (*c.*) *occulta*, and might reliably identify White-necked Petrel (Hadoram Shirihai, © Tubenoses Project)

Figure 7. Vanuatu Petrel *Pterodroma* (*cervicalis*) *occulta*, off Mota Lava, Banks Islands, December 2009; some appear chunkier like this bird, and seem to hardly differ in size and proportions from White-necked Petrel *P. cervicalis* (Hadoram Shirihai, © Tubenoses Project)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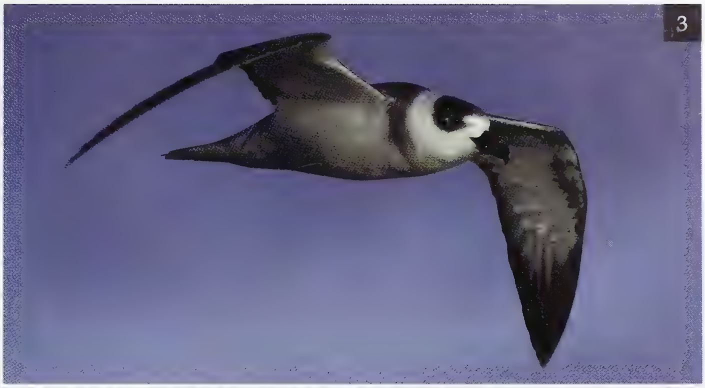
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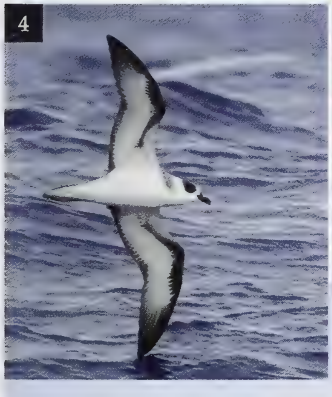
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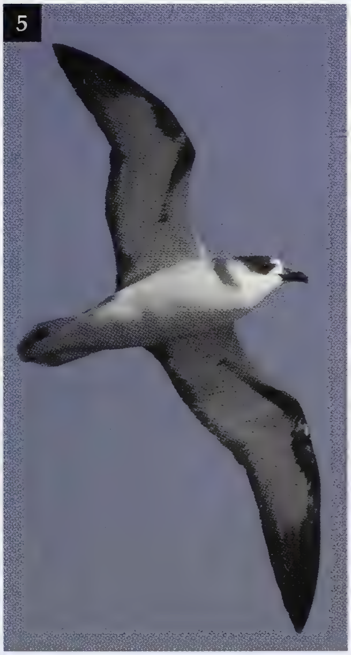
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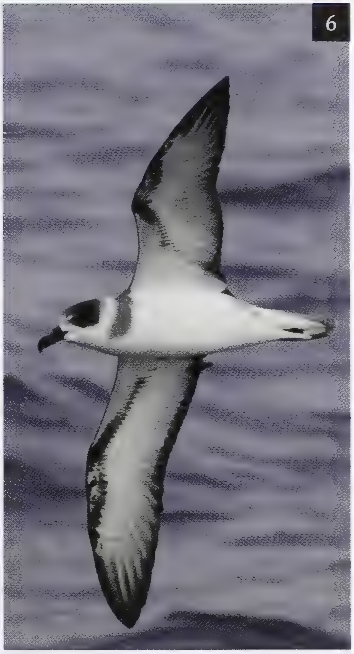
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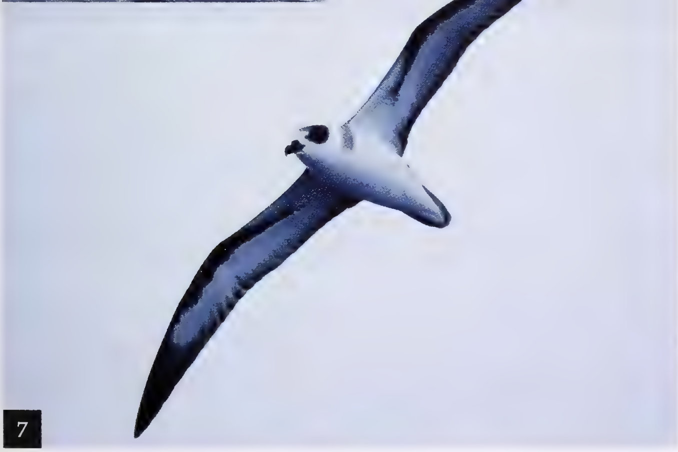
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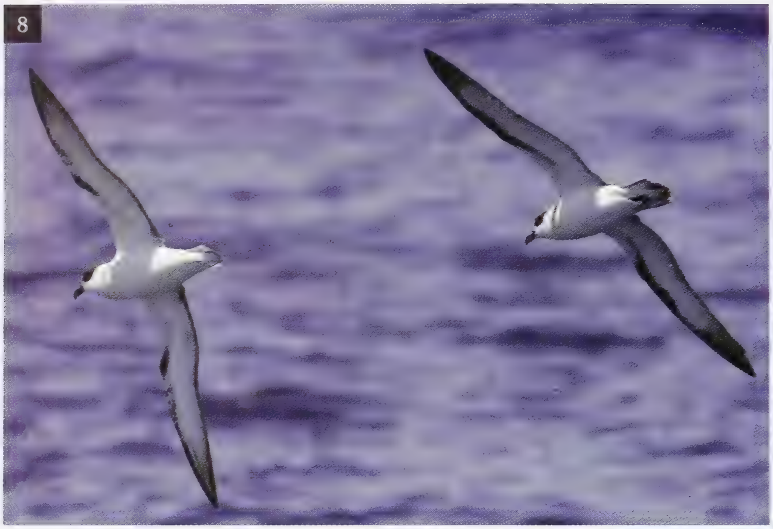
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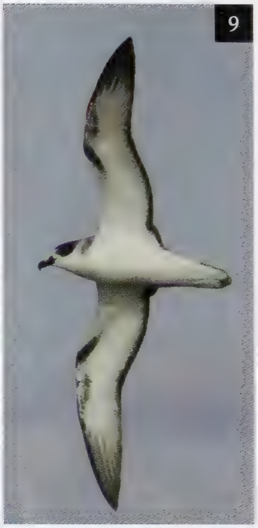
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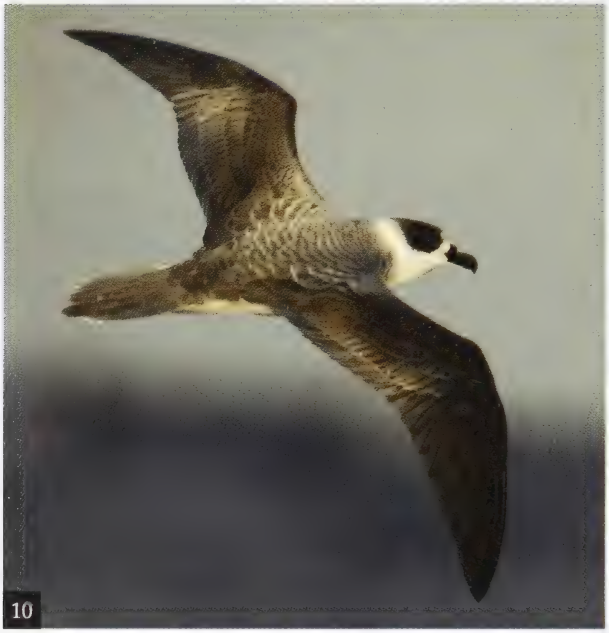
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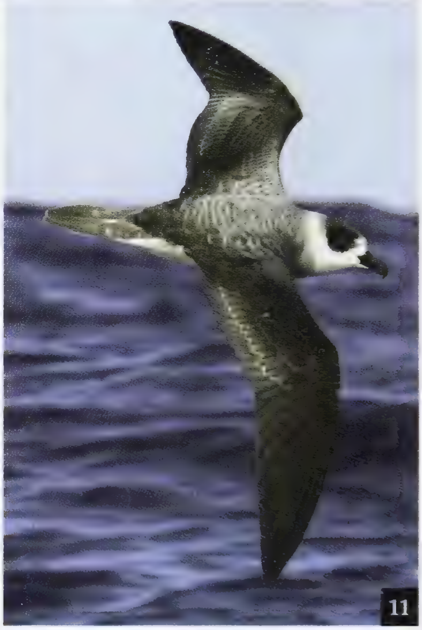
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Figure 8. White-necked Petrels *Pterodroma cervicalis*, Kermadec Islands, January 2006, showing the extreme spectrum of variation, with the right bird having an underwing type similar to many Vanuatu Petrels *P.* (*c.*) *occulta*. Note the general tendency for those with whiter wingtips to also have a weak dark leading edge and diagonal bar (left bird) whereas birds with more solid dark wingtips also have the black border to the underwing better developed (right). Note also how these birds vary in size. Our study revealed that all stages of variation in the underwing pattern exist in White-necked Petrels in the Kermadec Islands (Hadoram Shirihai, © Tubenoses Project)

Figure 9. White-necked Petrel *Pterodroma cervicalis*, Kermadec Islands, January 2006; the left (top) wing appears to have more contrasting and blacker primary tips than the right wing, due to the slightly different angle of the light (Hadoram Shirihai, © Tubenoses Project)

Figures 10–11. Comparison between Vanuatu Petrel *Pterodroma* (*cervicalis*) *occulta*, off Mota Lava, near Vanua Lava, Banks Islands, December 2009 (left) and White-necked Petrel *Pterodroma cervicalis*, Kermadec Islands, January 2006 (right), showing the lack of any obvious differences in bill size and structure; the tail of Vanuatu Petrel appears slightly longer and more pointed, but this is due to the angle and flight mode (Hadoram Shirihai, © Tubenoses Project)

Vanuatu Petrel is unknown, but almost certainly much smaller, perhaps just 1% of that of White-necked. Thus, over much of the Pacific, even close to Australia and further north, the probability of seeing White-necked is far greater than that of Vanuatu Petrel.

Identification recommendations.—To conclude, the identification process is clouded by much individual variation and overlap between the two forms. In practice, birds away from their respective breeding islands cannot be reliably identified to one form or the other. However, this should not prevent observers from recording and photographing birds, and this may eventually lead to the discovery of an area where most birds show more solidly black underwing tips and generally lighter / smaller size.

At-sea behaviour of Vanuatu Petrel

During three days (25–27 December 2009) we spent considerable time observing Vanuatu Petrels off Vanua Lava and Mota Lava. Late in the afternoon, petrels gathered at sea before flying to Vanua Lava, and in the morning they were regularly seen close to Mota Lava (although they probably returned to the ocean before dawn). They were seen especially around 13°32.506′S, 167°42.431′E and 13°34.257′S, 167°37.417′E. Later in the evening, a few birds were seen just a few miles off Mota Lava at 13°35.287′S, 167°37.751′E. During the day we found few Vanuatu Petrels (max. 5 in one location) with feeding 'frenzies' of other seabirds, mostly between 13°24.285′S, 167°40.982′E and 13°23.689′S, 167°46.996′E. The species obviously specialises in taking flying fish and squid, and is usually found either at the sides or in front of the feeding 'frenzies' of boobies (*Sula* spp.) and noddies (*Anous* spp.), targeting flying fish by gliding at high speed to catch their prey in the air. Some aerial pursuits lasted up to 300 m (with sharp turns and zigzags) and up to two minutes. Future observations may elucidate ecological differences between the two forms, but the smaller size of Vanuatu Petrel seems to match its range at lower, warmer latitudes.

Observing Vanuatu Petrel

We found that one could travel around the Banks Islands for days and not see any Vanuatu Petrels. At least in December, Vanuatu Petrel is very locally distributed, apparently being mainly found along a very narrow corridor to the north-east of Vanua Lava. Our work off Vanua Lava was mostly in a small (7-m) boat with a single engine, but this proved dangerous in the usually very rough ocean to the north. Field observers could visit Mota Lava and watch off the north coast, from where they would be almost guaranteed to see Vanuatu Petrels arriving from the north-east in late afternoon / evening, in December–May at least.

Acknowledgements

We thank all our fellow members of the Banks Expedition in December 2009: Audrey Sternalski, Orian Shirihai, Jakob Wikstrom, Eyal Jacobson and Maya Dvori-Jacobson. We also thank the many great people from the islands Vanua Lava, Mota Lava and Ureparapara, for their logistical help and welcome during our visit to the Banks. Also thanks to François Levionnois (New Caledonia) for helping HS organise his pelagic work in 2005–07, and to Bill Bourne for interesting discussions and encouragement. Particular thanks to Walter Boles, Curator of Birds at the Australian Museum, Sydney, for access to the Vanuatu Petrel specimen, and to the collections in New York (Paul Sweet), Tring (Robert Prŷs-Jones) and Paris (E. Pasquet).

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The name *Ramphastos piperivorus* Linnaeus revisited

by Vítor de Q. Piacentini, José Fernando Pacheco & Bret M. Whitney

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Discussion of the proper name for the Guianan Toucanet (a member of the ramphastid genus *Selenidera*) first appeared in ornithological literature when Hellmayr (1907) commented on the indeterminacy of *Ramphastos piperivorus* Linnaeus, 1758. Pacheco & Whitney (2006) suggested that the name *R. piperivorus* Linnaeus, 1766, has priority over *Pteroglossus Culik* Wagler, 1827 [= *Selenidera culik* (Wagler, 1827)] for this species. Thereafter, several colleagues questioned the rationale presented in favour of *piperivorus*, arguing that *Ramphastos piperivorus* Linnaeus, 1766, is better considered a homonym of the apparently indeterminate *Ramphastos piperivorus* Linnaeus, 1758. A synthesis of these arguments was published by Walters (2007). That led us to re-examine the case and our conclusion, presented here, agrees with Pacheco & Whitney (2006) that *R. piperivorus* Linnaeus is the applicable name according to the *International code of zoological nomenclature* (ICZN 1999; hereafter, the Code). Its date of publication, however, must be corrected to 1758.

Availability of the name of 1758 and possible homonymy of the name of 1766

Linnaeus (1758) described *Ramphastos piperivorus* in the tenth edition of the *Systema Naturae*, p. 103, as follows: 'piperivorus 1. R[amphastos] rostro nigro: carina crassisima. *Habitat in* America *meridionali*.'

Peters (1930) stated that the species is 'absolutely unidentifiable'. However, the Code does not state that indeterminacy provides reason to reject a name. The Code presents only 'criteria of availability'. Chapter 4 (Arts. 10–20) deals with them. It is clear to us that *Ramphastos piperivorus* Linnaeus, 1758, satisfies all these criteria and therefore is an available name. The explanation for the *nomen nudum* in the Glossary of the Code (p. 111) permits additional interpretation of what constitutes an unavailable name and must be considered (Art. 89.1). For names published before 1931, *nomina nuda* would simply be those that 'fail to conform to article 12'. That article deals with the 'requirement' (Art. 12.1) for 'names published before 1931' to be available, stating that they 'must be accompanied by a description or a definition of taxon that it denotes, or by an indication'. Neither Art. 12.1 nor the Glossary for *nomen nudum* stipulates that the description / definition must allow unequivocal identification of the taxon denoted. Because there is a description associated with *Ramphastos piperivorus* in Linnaeus, 1758, the name cannot be considered a *nomen nudum*. More importantly, were the name of 1758 to be considered unavailable as such, then the principle of homonymy would in any case not apply, and the name of 1766 would be automatically validated, as discussed by Pacheco & Whitney (2006).

Peters (1930) considered that, given the brief and unidentifiable description of *R. piperivorus* in 1758, the 1766 usage of *piperivorus* (with its longer description) would relegate it to primary homonymy and thus unavailable. We cannot agree with his conclusions. The 'Principle of Homonymy' (Art. 52.1) applies only 'when two or more taxa are *distinguished* from each other' and are denoted by the same name. Thus there is a key question to answer: is *Ramphastos piperivorus* Linnaeus, 1758 a different taxon from *Ramphastos piperivorus* Linnaeus, 1766?

The complete history of *Ramphastos piperivorus* Linnaeus

In 1741, the French naturalist and physician Pierre Barrère described a bird from 'Equinoctial France' (= Cayenne, where he lived for five years) as '*Pica minor, rostro denticulato, vario*' and gave it two vernacular names: *Gros Bec* and *Queue de rat*. Four years later, Barrère (1745) described the four toucans and allies known by him at the time in the 'genus' *Rostrata*. The bird called *Gros Bec* and *Queue de rat* was then described as '*Rostrata americana viridans, rostro partim rubro nigro*'. According to Brisson (1760), Barrère was the first naturalist to describe such a bird.

Following Barrère, Linnaeus (1748) described a bird in the sixth edition of the *Systema Naturae* using almost the same words: '*Rostrata viridans, rostro nigro partim rubro*'; the source given by Linnaeus (1748) is 'Barr 51'[= Barrère, p. 51], which unquestionably indicates that they were dealing with the same species. Ten years later, in the critically binominal tenth edition of the *Systema Naturae*, Linnaeus (1758) described *R. piperivorus* in just a few key words ('*rostro nigro*') without any reference to other publications or figures (see above).

Brisson (1760) then described and illustrated (Pl. XXXII, Fig. 2) a toucan, and referenced it as being the same as described in Barrère (1741, 1745) and in Linnaeus (1748). Edwards (1764) also illustrated the species and his painting, as well as that of Brisson, is clearly assignable to the Guianan Toucanet.

Finally, in the 12th edition of the *Systema Naturae*, Linnaeus (1766: 150) gives a longer description of his *R. piperivorus*: '*R*[*amphastos*] *viridis antice niger, crisso femoribusque rubris*' and referenced it to the works of Brisson (1760) and Edwards (1764).

It is thus clear to us that the *R. piperivorus* described briefly in Linnaeus (1758) is the same bird species described (without a name and prior to the starting point of zoological nomenclature) in Linnaeus (1748) and that named *R. piperivorus* in Linnaeus (1766). The words used in the descriptions connect the birds from the works of 1758 and 1748 (which explicitly refers to Barrère); the name *piperivorus* connects the birds of the works of 1758 and 1766; and the references cited by Linnaeus connect the bird of the work of 1766 again to Barrère (through Brisson, 1760) and to the unquestionably identifiable bird illustrated by Edwards (1764). There is no reason to believe that the name of 1766 denotes a nominal taxon different from that of 1758, quite the contrary. Thus, the burden of proof must fall on those who assert that an author (Linnaeus), in two editions of a single work (*Systema Naturae*), applied the same name (*R. piperivorus*) to different species. It is important to note that this interpretation was not provided by Pacheco & Whitney (2006) and awareness of it by Walters (2007) is based on correspondence between E. Dickinson, M. Walters, us, and other colleagues.

Application of the Code

Ramphastos piperivorus Linnaeus, 1758, is an available name and the taxon it denotes is precisely identifiable based on an unambiguous combination of external references. The name therefore applies strictly to the Guianan Toucanet and has priority over *Pteroglossus culik* Wagler, 1827. Using a similar approach, Peters (1930) employed external evidence (a plate in Petiver, 1709) to identify another toucan, *Ramphastos tucanus* Linnaeus, 1758, a similar procedure already accepted.

Walters (2007), as well as other colleagues in favour of the name *P. culik* (through private correspondence), gave Peters' (1930) opinion much gravity. Although a minor semantic question, it must be stressed that Peters' 'decision' was merely his interpretation of the case and has no special value. Thus, contrary to Walters (2007), the 'convincing evidences' in favour of one name or another must address the objective availability of the name *R. piperivorus* Linnaeus rather than trying to 'negate Peters' decision to reject *Ramphastos piperivorus* Linnaeus'.

Finally, because *Selenidera* is feminine and *piperivorus* is an adjective, the correct combination of *piperivorus* Linnaeus, 1758 in the genus *Selenidera* is *S. piperivora*.

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Authorship of the broadbill genus name *Calyptomena* and the correct citations for this and *Calyptomena viridis* Raffles

by D. R. Wells & Edward C. Dickinson

Received 21 September 2009

The Green Broadbill *Calyptomena viridis* occurs or has occurred recently throughout lowland Borneo, Sumatra, and far-western mainland Southeast Asia from the Thai-Malay Peninsula north to latitude *c.*16°N (Wells 2007). First-described member of the genus, its names have long been attributed to T. S. Raffles (Raffles 1822), including by us (Dekker & Dickinson 2000, Wells 2007). However, a coloured plate, anatomical drawings and text all titled *Calyptomena viridis* also appeared in the fourth part of T. Horsfield's *Zoological* *researches in Java, and the neighbouring islands*, issued apparently in June 1822, whereas the part of the *Transactions of the Linnean Society* carrying the relevant section of Raffles' *Descriptive catalogue* was not delivered before November 1822 (Raphael 1970). *Zoological researches* issue dates were unravelled by C. W. Richmond and, based on his findings, Oberholser (1921) used the discrepancy to propose that genus and species authorships both revert to Horsfield. Peters' *Check-list* (Peters 1951) made no mention of this revision, but Mees (1989) rejected it on the grounds that Horsfield had attributed his description of species *viridis* directly to Raffles under a heading 'Calyptomena viridis, Sir T. S. Raffles's Cat. of a Zool. Coll. made in Sumatra, Tr. Linn. Soc. XIII. p. 295, 1822', below which Raffles' wording was given *verbatim*, in quotation marks, with a page number that could only have been taken from the *Descriptive catalogue* proof sheets.

Thus far, Mees' interpretation has not been challenged but a re-inspection of Horsfield's text shows the latter's quote from Raffles to be preceded by a separate diagnosis, in Latin, under an independent heading 'Calyptomena, Raffles. Act. Soc. Linn. Lond.' ('Acta' here an apparent latinisation of 'Transactions', denoting the Linnean Society's only serial publication at this date), i.e., without mention of the species. Even though Raffles' name featured in that heading, too, no text from or direct allusion to the *Catalogue* was included and nothing about this passage implies that it came other than from Horsfield's own pen. Note also that Horsfield included anatomical drawings not found in the *Catalogue* and that his coloured plate is not a copy of the only illustration of a Green Broadbill directly attributable to Raffles (not published in the *Catalogue* but one of a collection of natural history drawings shipped by him from Sumatra in mid 1820: now British Library cat. no. NHD 4/661). As the first-published describer of *Calyptomena*, notwithstanding wording in the *Catalogue* that he must have been aware of, it follows that Horsfield is the author of the generic name. The correct citation for this name, *contra* Peters (1951: 12), thus is:

> *Calyptomena* Horsfield, 1822 (July), *Zoological researches in Java, and the neighbouring islands* pt. 4, unnumbered plate and text page.

As Mees implied, but for the inclusion of quotation marks Oberholser would have been correct to argue that the name *Calyptomena viridis* must also be cited from Horsfield's publication. This punctuation makes clear that the description came from Raffles, hence the species name *viridis* is still to be credited to Raffles. It nevertheless now follows that the proper citation is to Raffles *in* Horsfield, 1822, full wording as given above for the generic name, although in the usual way still contractable to 'Raffles, 1822'. It is also worth mentioning that on independent evidence of surviving specimen material (Wells in prep.) Horsfield's coloured plate of *viridis* has no type status.

In passing, we note that, with more information at his disposal than available to Richmond or Oberholser, Bastin (1990) has re-studied the issue dates of the eight parts of

TABLE 1

The eight parts of Horsfield's *Zoological researches in Java* and their dates.

	Latest date on the plates	Date in Bastin (1990)	Comments
1	July 1821	July 1821	
2	November 1821	November 1821	
3	February 1822	April 1822	Two of the four bird plates are dated January 1822
4	June 1822	July 1822	
5	October 1822	January 1823	Note delay into next year
6	April 1823	June 1823	
7	October 1823	January 1824	Note delay into next year
8	April 1824	September 1824	

Zoological researches. Table 1 compares his findings with the dates published on the plates, and we draw these to the attention of ornithologists who may not have seen Bastin's work.

Acknowledgements

DRW thanks Alison Harding of the Natural History Museum, Tring, for access to the Rothschild Library's copy of Horsfield's book, and the staff of the Asian and African Studies Department of the British Library for allowing an inspection of the Raffles drawings. ECD thanks Judith Magee and others at the General Library of the Natural History Museum, South Kensington, London, for access to the 1990 facsimile of Horsfield's *Zoological researches*, shelf reference 77 Ab f HOR, which contains Bastin's introduction. We thank Alan Peterson for constructive comments on two manuscripts here combined.

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A record of active moult in the Streaked Reed Warbler *Acrocephalus sorghophilus*

by Philip D. Round & Desmond Allen

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Streaked Reed Warbler *Acrocephalus sorghophilus* is a globally threatened species, the breeding grounds of which are not known with certainty, but presumed to be in north-east Asia ('probably Manchuria': Vaurie 1959; or 'a very limited area of Liaoning and Hebei': Brazil 2009). Most previous records are of birds either seen or collected on migration in east and north-east China, and from the Dalton Pass, Nueva Vizcaya Province, Luzon, the Philippines. The only wintering records come from the Philippines, most at a single site, Candaba Marsh, Pampanga Province, Luzon (BirdLife International 2001). Numbers detected have declined markedly in the past three decades. There were 18 sightings totaling 69 birds in 1981–90, compared with only 11 sightings of 22 individuals in 1991–2007. All but three of these were at Candaba (T. H. Fisher *in litt*. 2009).

We conducted a mist-netting survey for *A. sorghophilus* at Candaba Marsh and other wetland sites in central Luzon on 9–22 March 2009. The only *A. sorghophilus* found during this period was caught in the bottom shelf of a mist-net, set at the edge of a small patch of *Phragmites*, in a wet, *Polygonum*-filled ditch, on 10 March. It was ringed and examined, and was found to be moulting the inner primaries. P1 (descendent numbering) was less than $^{1}/_{3}$ grown (moult score 2) and p2 was missing, giving a primary moult score of 3, following Ginn & Melville (1983). All other flight feathers and contour feathers were old, unmoulted and so heavily worn that it was impossible to determine whether the bird was an adult or a first-year. This appears to be the first published record of moult in *A. sorghophilus*. The bird weighed 7.2 g and had muscle and fat scores of 2 and 0 respectively (following Bairlein 1995).

If the single 2009-trapped bird was typical, it appears that the timing of moult in *A. sorghophilus* may be roughly comparable with, e.g., Pallas's Grasshopper Warbler *Locustella certhiola* and Middendorff's Grasshopper Warbler *L. ochotensis*, in which most individuals undergo a complete moult in late winter to early spring, shortly before northbound migration. Asian-wintering *Acrocephalus* species exhibit a range of moult strategies with some (e.g., Oriental Reed Warbler *A. orientalis* and Black-browed Reed Warbler *A. bistrigiceps*) having a complete post-nuptial moult on the breeding grounds, whilst others (e.g., Blyth's Reed Warbler *A. dumetorum*, Paddyfield Warbler *A. agricola* and Manchurian Reed Warbler *A. tangorum*) apparently commence moult soon after arriving in their winter quarters, or at least in the early part of the winter (Svensson 1992, Round & Rumsey 2003).

The plumage of a single *A. sorghophilus* photographed at Muraviovka Park, near Blagoveschensk, Amurskaya Oblast, Russian Federation, on 21 June 2004 (F. Pekus *in litt.* 2009) (reported as 22 June 2004 in Round 2009), appeared relatively fresh, with prominent, clearly streaked upperparts, and broad, pale, unabraded fringes to its tertials, primaries, secondaries and rectrices, providing further support for a complete late winter or early spring moult.

Our single *A. sorghophilus* was caught among 235 birds (including 122 other *Acrocephalus* warblers) mist-netted in marshy, mainly *Phragmites*-dominated, wetland habitats at six discrete sites in central Luzon during the 9–22 March period (Round 2009). Thus the species appears to be genuinely scarce, presumably due (at least, in part) to the widespread conversion of former wetland vegetation to rice paddy. It is also possible that its preferred wintering habitat is wetland vegetation other than *Phragmites* that had been removed, or was not encountered, during the survey. Additionally, if Streaked Reed Warblers were moulting during the period of the survey this may have inhibited their mobility, reducing the probability of capture. Obtaining more information on the ecology, distribution and status of this threatened bird is an urgent requisite for its future conservation.

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First record of Nicobar Pigeon *Caloenas nicobarica* in the Federated States of Micronesia

by Donald W. Buden, John Wichep & Gibson Santos

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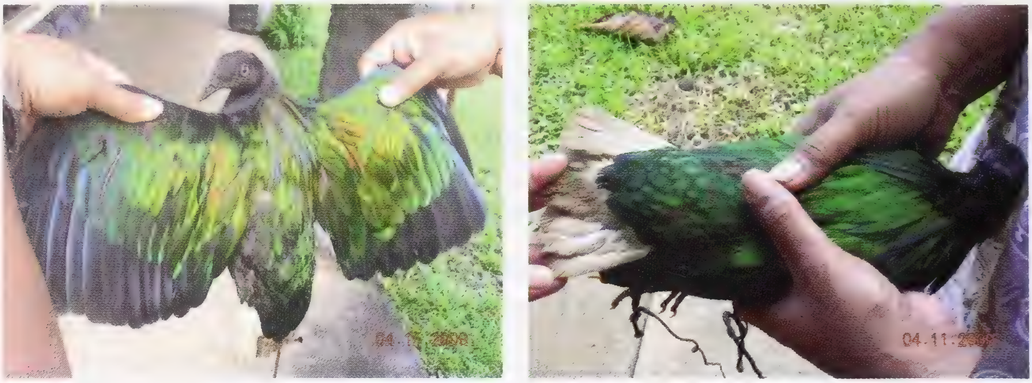
Nicobar Pigeon *Caloenas nicobarica* exhibits a spotty distribution from the Andaman and Nicobar islands (India) east to the Philippines and Republic of Palau (south-western Micronesia), and south through Indonesia and the New Guinea region to the Solomons (Baptista *et al.* 1997). It has a predilection for small, remote, and relatively undisturbed islands for breeding, sometimes in dense colonies, but the species disperses widely to larger islands and adjacent mainland areas to feed, often making lengthy oversea flights (Gibbs *et al.* 2001, BirdLife International 2009). Nicobar Pigeon is considered Near Threatened, with declining numbers throughout most of its range because of over-hunting, exploitation for the pet trade, habitat destruction, and predation by introduced mammals (BirdLife International 2008). However, the distinct Palau subspecies *C. n. pelewensis* has increased dramatically in recent years, possibly because of a local ban on shotguns, after being close to extinction immediately following World War II (Baker 1951, Pratt & Etpison 2008). Although it forages mostly on the ground, Nicobar Pigeon is a powerful flyer (Delacour 1959, Goodwin 1983, Gibbs *et al.* 2001), and highly nomadic (Baptista *et al.* 1997), thus making the species predisposed to reach distant islands outside its normal range. Observations on Tench Island, in the northern Bismarck archipelago, indicated that Nicobar Pigeons commuted daily to forage on the larger islands to the south (Coates 1977; G. Dutson *in litt.* 2009), and, according to local reports (in Coates 1977), they leave the island altogether at certain times of the year but where they go is unknown.

A Nicobar Pigeon (Figs. 1–2) captured alive in Pohnpei (Fig. 3) on 3 November 2009 is the first documented record for the Federated States of Micronesia (FSM). Members of a local family working in a patch of agroforest in Nanmand Village, Kitti Municipality, in the south-west of the island first observed the bird then captured it by hand in the same area later in the day after seeing the bird run along a forest trail. They brought it to GS, who then showed it to JW who photographed the bird. GS kept the pigeon in captivity for a short time in an attempt to rehabilitate it, but the bird died on 5 November and the remains



Figures 1–2. Nicobar Pigeon *Caloenas nicobarica* captured on Pohnpei, Federated States of Micronesia, 3 November 2009 (J. Wichep)

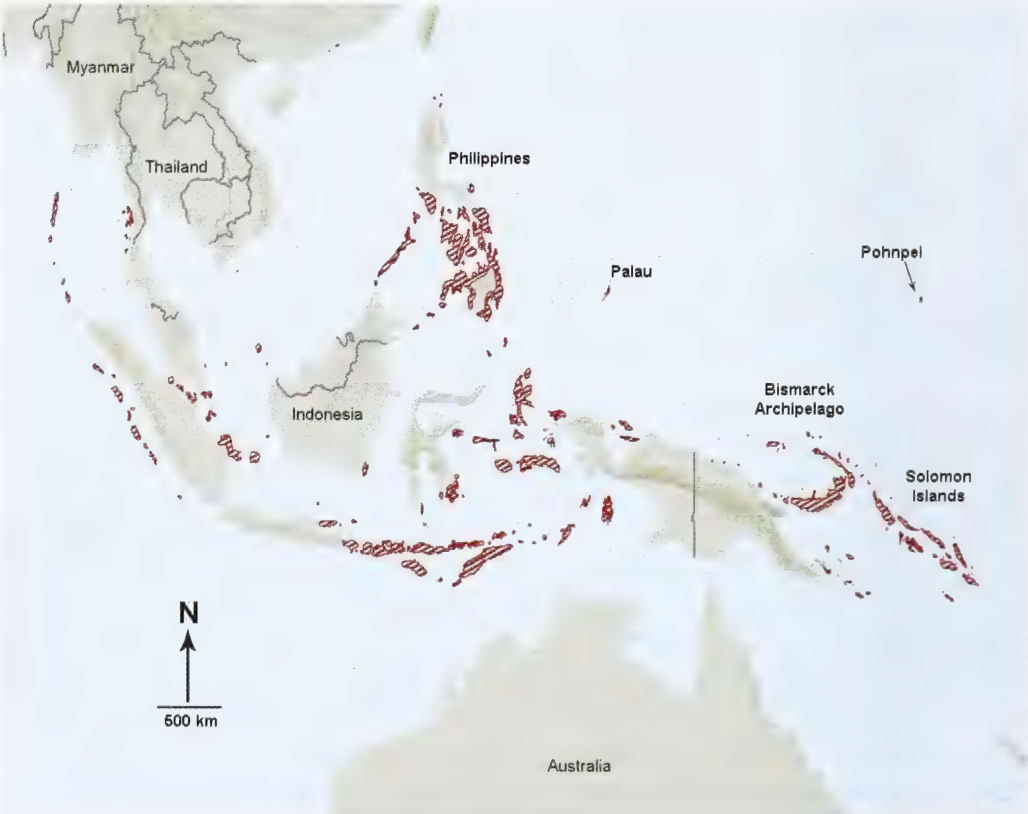

Myanmar
Thailand
Philippines
Palau
Pohnpei
Indonesia
Bismarck Archipelago
Solomon Islands
N
500 km
Australia

Figure 3. Range of Nicobar Pigeon *Caloenas nicobarica*; modified, with permission, from BirdLife International (2008).

were discarded in a compost heap. JW sent the photographs to DWB for identification, and GS subsequently retrieved the carcass on 9 November and brought it to the College of Micronesia, where the skeleton was preserved and is currently held.

The nearest population from which the Pohnpei bird could have originated is in north-eastern Melanesia, *c.*1,500 km to the south across mostly open ocean. The only resident population of *C. nicobarica* in the Caroline Islands, of which Pohnpei is a part, is in Palau, *c.*2,500 km to the west (but with numerous islands as potential intermediary stops). The endemic Palau subspecies differs from the nominate form in the rest of the range by its smaller size, shorter, less attenuated neck hackles (some with bifurcate tips), and bluer (less green and coppery) iridescent dorsal feathers (Baker 1951, Goodwin 1983, Gibbs *et al.* 2001). (Note that Baptista *et al.* 1997 incorrectly depict *C. n. pelewensis* with all of the hackles bifurcate.) Compared with a series of specimens of the nominate subspecies and single examples each of adult *C. n. pelewensis* in the Smithsonian Institution, Washington DC (S. L. Olson *in litt.* 2009) and the American Museum of Natural History, New York (M. LeCroy *in litt.* 2009), the coloration in the photographs of the Pohnpei bird is closer to that of *C. n. nicobarica* than *C. n. pelewensis.* Also, the neck hackles of the Pohnpei bird were longer and narrower than those shown in published photographs of *C. n. pelewensis* (Pratt & Etpison 2008) and none were bifurcate. Measurements (in mm) of the coracoid (greatest length 47.8, least shaft width 4.2, sternal facet width 11.2, sternal facet depth 4.8) of the Pohnpei specimen all fall near or at the upper range limits of *C. n. nicobarica* reported in Balouet & Olson (1989) [skeletal material of *C. n. pelewensis* not available], and the measurements of the humerus (distal width 13.8), and length of radius (67.8), exceed the range limits (12.5–13.4 and 58.4–64.3, respectively, *n* = 21). However, the skeletal material of *C. n. nicobarica* examined by Balouet & Olson (1989) included many zoo birds and their measurements may differ somewhat from wild-caught birds. Whether the larger and longer wing bone measurements in the Pohnpei bird represent extreme individual variation, or if they are characteristic of the local population whence it came is unknown, but they eliminate derivation from Palau.

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Authorship and type specimens of *Uria mandtii* (Alcidae)

by Jiří Mlíkovský

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Black Guillemots of the northern Arctic seas are usually separated subspecifically as *Cepphus grylle mandtii* (e.g. Vaurie 1965, Cramp 1985, Nettleship 1996, Dickinson 2003). Citation of the author and date of the original description of this form are confused in the literature. The species-group name was attributed to Lichtenstein (1823) by most early authors (e.g. Keyserling & Blasius 1840: xcii, Schlegel 1844: cviii, Schlegel 1867: 18, Coues 1868: 72, Rey 1872: 157, Giebel 1877: 741). Coues *et al.* (1886: 82, 1895: 10) and Coues (1896; see also Ogilvie-Grant 1898: 584, and Sherborn 1928: 3849) suggested that the name should be attributed to Lichtenstein (*in* Mandt 1822). For unknown reasons, their correct view has been abandoned, and 20th-century authors (e.g. Allen *et al.* 1910: 30, Ridgway 1919: 739, Hartert 1921: 1776, Austin 1934, Peters 1934: 354, Dement'ev 1951: 203, Kozlova 1957: 73, Vaurie 1965: 514, Glutz von Blotzheim & Bauer 1982: 1091, Cramp 1985, Nettleship 1996: 711, Dickinson 2003: 154, Stepanyan 2003: 269) generally attributed the name to Mandt (1822) himself.

The name *mandtii*, as published in the binomen *Uria mandtii*, first appeared in the printed version of a dissertation defended at Berlin University in 1822 by Martin Wilhelm Mandt (1800–58; latinised as Martinus Guilelmus Mandt), then a student of medicine in Berlin and subsequently physician at the court of Emperor Nicholas I (1796–1855) in St. Petersburg, Russia (see Mandt 1917, Erichsen 1936). Copies of this book survive at least in the following libraries: Deutsche Staatsbibliothek, Berlin, Germany (two copies); Cambridge University Library, Cambridge, MA, USA; København Universitets Bibliotek, Copenhagen, Denmark; Natural History Museum, London, UK; and Smithsonian Institution Libraries, Washington, DC, USA. The book thus meets the criteria for publication under Art. 8.1 of the *International code of zoological nomenclature* (ICZN 1999). The section in question reads as follows (// = new paragraph): 'Avium ..., quae quum nihil non cognitum exhibere videantur, hic tantum de ea quaedam subiiciam, quam ill Lichtenstein tanquam novam speciem, nomine designavit // Uriae Mandtii. // Humantissime mecum sequentes notas communicavit characteristicas quibus insignitur: …' (Mandt 1822: 30). The colon is followed by a diagnosis of the species. Mandt mentions explicitly in the text reprinted above, that 'Lichtenstein', i.e. Martin Hinrich Carl Lichtenstein (1780–1857), professor of zoology and Mandt's tutor at the Berlin University and also head of the Zoological Museum in Berlin, supplied him with both the name and the diagnosis of the new species. Following the *International code of zoological nomenclature* (ICZN 1999, Art. 50.1), Lichtenstein is thus the author of this nominal taxon, although the name was published in another author's work. Correct citation of the name is thus *Uria mandtii* M. H. C. Lichtenstein *in* Mandt, 1822, and its current taxonomic position: *Cepphus grylle mandtii* (M. H. C. Lichtenstein *in* Mandt, 1822).

Lichtenstein (1823: 88) apparently did not consider Mandt's (1822) dissertation a publication and described the species anew, with the same name and a diagnosis very similar to that printed in Mandt (1822), but without reference to that work. Being based on the same type series as *Uria mandtii* Lichtenstein *in* Mandt (see below for relevant specimens), *Uria mandtii* Lichtenstein, 1823, is both a junior objective synonym and a junior homonym of *Uria mandtii* Lichtenstein *in* Mandt, 1822.

Both *Uria Mandtii* Lichteinstein *in* Mandt, 1822, and *Uria Mandtii* Lichtenstein, 1823, were based on three specimens collected by Mandt in 1821 at Spitsbergen (exact locality unknown) and brought to Berlin (see Mandt 1822, Lichtenstein 1823: 88). Lichtenstein (1854: 105) listed three specimens of *Uria Mandtii* from 'Spitzbergen' in the Museum für Naturkunde (ZMB), Berlin, Germany. Only two of these were registered in the *Sammlungs-Katalog* of the ZMB under inventory nos. ZMB 14416–417. I found only one of these syntypes (ZMB 14416) in the ZMB in 2007, the other being probably lost. The third syntype was forwarded by Lichtenstein to the Rijksmuseum van Natuurlijke Historie (now: Naturalis; RMNH), Leiden, Netherlands, between 1854 and 1867, when this specimen was already mentioned by Schlegel (1867: 19; *cf.* Coues 1868: 72). It was not listed in the relevant catalogue of avian types at the RMNH (Hoek Ostende *et al.* 1997), because the specimen was not recognised as a type at the time, but is still present there (catalogued as RMNH.AVES.91009; S. van der Mije *in litt.* 2009).

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CONTENTS

Club Announcements 73
RYAN, P. G., NUPEN, L., ROSE, B. & SULEIMAN, A. S. Geographic variation in Socotra Sparrows *Passer insularis* 75
KIRWAN, G. M. & GRIEVE, A. How many subspecies of Coal Tit *Periparus ater* are there in Iran? 83
TOMKOVICH, P. S. Assessment of the Anadyr Lowland subspecies of Bar-tailed Godwit *Limosa lapponica anadyrensis* 88
COLLINS, C. T. A review of natal pterylosis of passerines: useful information or avian marginalia? 96
SCHOENJAHN, J. The type and other early specimens of Grey Falcon *Falco hypoleucos* 102
PORTER, R. F. & KIRWAN, G. M. Studies of Socotran birds VI. The taxonomic status of the Socotra Buzzard 116
SHIRIHAI, H. & BRETAGNOLLE, V. First observations at sea of Vanuatu Petrel *Pterodroma* (*cervicalis*) *occulta* 132
PIACENTINI, V. Q., PACHECO, J. F. & WHITNEY, B. M. The name *Ramphastos piperivorus* Linnaeus revisited 141
WELLS, D. R. & DICKINSON, E. C. Authorship of the broadbill genus name *Calyptomena* and the correct citations for this and *Calyptomena viridis* Raffles 143
ROUND, P. D. & ALLEN, D. A record of active moult in the Streaked Reed Warbler *Acrocephalus sorghophilus* 145
BUDEN, D. W., WICHEP, J. & SANTOS, G. First record of Nicobar Pigeon *Caloenas nicobarica* in the Federated States of Micronesia 147
MLÍKOVSKÝ, J. Authorship and type specimens of *Uria mandtii* (Alcidae) 150

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As far as possible, review, return of manuscripts for revision and subsequent stages of the publication process will be undertaken electronically.

For instructions on style, see the inside rear cover of Bulletin 130(1) or the BOC website.

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102

Bulletin of the British Ornithologists' Club

THE NATURAL
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Volume 130 No. 3
September 2010

MEETINGS are normally held in the ground floor of the Sherfield Building of **Imperial College**, South Kensington, London, SW7. This suite is now called the **Tower Rooms** and meetings normally take place in **Section A** with the entrance opposite the Queen's Tower in the main quadrangle. The nearest Tube station is at South Kensington; a map of the area will be sent to members, on request. (Limited car parking facilities can be reserved [at a special reduced charge of **£5.00**], on prior application to the Hon. Secretary.)

The cash bar is open from **6.15 pm**, and a buffet supper, of two courses followed by coffee, is served at **7.00 pm.** (A vegetarian menu can be arranged if ordered at the time of booking.) Informal talks are given on completion, commencing at about 8.00 pm.

Dinner charges are **£22.50** per person.

FORTHCOMING MEETINGS

See also BOC website: **http://www.boc-online.org**

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21 September—Dr Andrew Gosler—*Eggs dressed and undressed*

Dr Gosler (Edward Grey Institute, Oxford University) is well known for the studies he has carried out over many years on the tit populations in Wytham Woods, near Oxford. His talk will provide an overview of recent research he has been conducting into the functional ecology of eggshell pigmentation, which includes novel ideas regarding the selective factors underlying variation in the external appearance of eggs.

Applications to Hon. Secretary (address below) by **7 September 2010**

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2 November—Michael Jennings—*Birds of Arabia*

Mike Jennings has been interested in the birds of Arabia since 1969, when he worked in Bahrain, and later in Riyadh, Saudi Arabia in 1975. In the early 1980s he started a programme to collect bird distribution data for the Atlas of the Breeding Birds of Arabia (ABBA) project, which has taken him on 41 targeted field surveys to every corner of Arabia. The ABBA project has also involved contributions from 500 observers past and present, and a review of the published literature on the birds of the peninsula and examination of many specimens in museums. The atlas is due for publication in summer 2010 and will include species accounts, maps and drawings for 273 birds known to have bred in Arabia and shorter notes on a further two dozen thought likely to breed. He will talk about the aspects that make ornithology and birdwatching in Arabia so interesting. These include its zoogeographical position, with elements of the avifauna of the Palearctic, the Afrotropical and the Indo-Malayan regions; the high incidence of endemism (23 species in the peninsula and Socotra); Arabia's pivotal position on migration routes from Africa to Eurasia and India to Eurasia, and for a few species Africa to India; the large number of introduced, feral breeding species (20+); and its diverse topography, climate and vegetation.

Applications to Hon. Secretary (address below) by **19 October 2010**

Overseas Members visiting Britain are especially welcome at these meetings, and the Hon. Secretary would be very pleased to hear from anyone who can offer to talk to the Club giving as much advance notice as possible—please contact: S. A. H. (Tony) Statham, Ashlyns Lodge, Chesham Road, Berkhamsted, Herts. HP4 2ST, UK. Tel. +44 (0)1442 876995 (or e-mail: boc.sec@bou.org.uk).

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Bulletin of the
BRITISH ORNITHOLOGISTS' CLUB

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CLUB ANNOUNCEMENTS

Members are reminded that subscriptions were due for renewal on 1 January 2010 and are again respectfully requested to check that any Standing Orders are correctly lodged with their banks. Subscriptions are £20 p.a. regardless of whether the subscriber is a member of the BOU or not.

The 960th meeting of the Club was held on Tuesday 16 March 2010 in the Sherfield Building, Imperial College, South Kensington, London, SW7. Thirteen members and three guests were present.

Members attending were: Miss H. BAKER (*Chairman*), Cdr. M. B. CASEMENT, RN, S. E. CHAPMAN, S. M. S. GREGORY, D. GRIFFIN, K. HERON JONES, Dr J. P. HUME, R. R. LANGLEY, Dr C. F. MANN, D. J. MONTIER, Dr R. P. PRŶS-JONES, S. A. H. STATHAM and C. W. R. STOREY.

Guests attending were: Mrs J. HERON JONES, Mrs M. MONTIER and Mrs A. J. McDONALD.

After dinner, Dr Julian Hume gave an informative and well-illustrated talk on the *Birds of the Comoros Islands*. The Comoros comprise four main volcanic islands, Mayotte, Moheli, Anjouan and Grand Comore, situated between Mozambique and Madagascar. They have been inhabited since the fifth century, so human-induced environmental change has continued for the last 1.5 millennia. Despite this, 146 species have been recorded, of which 14 endemic species and subspecies of bird survive, albeit some are very rare, and they are mainly concentrated in the remnant forests. The birds have strong biogeographical connections with Madagascar and Africa, and only one species, Homblot's Flycatcher *Humblotia flavirostris*, belongs to an endemic genus. Moheli, the smallest island, still harbours many bird species, most notably four sympatric species of pigeon, unique within the south-west Indian Ocean islands. The birds are easily detected but human disturbance is high. Anjouan is under the greatest threat of encroachment, with almost all of its forests degraded to some degree and even these continue to be cut for firewood. Many of the bird species are confined to the remnant montane forests and are only viewable after steep hikes. Grand Comore is the largest and youngest island, and its main volcano, Mount Karthala, boasts one of the largest active craters in the world. Most of the endemic birds are concentrated around the crater, and after a long hike it is possible to see most birds comparatively easily in the stunted forests. Unlike the other islands, which are a United Arab Republic, France administers Mayotte and standards of living are high. It still retains forest and has suffered less human disturbance than the other islands, despite good roads, and most of the birding areas are reached easily. Other than Mayotte, the Comoros have lagged behind in terms of tourism, are poverty stricken, and logistically difficult to travel around, not only between islands, but intra-island as well. The remaining forests are under extreme pressure from human encroachment, thus the long-term future of the avifauna is unfortunately rather tenuous.

Henry Seebohm

Tim Milsom is preparing a book on the ornithological achievements of Henry Seebohm (1832–95), who was a founder member of BOC. If any BOC members possess Seebohm manuscripts, including letters, books or papers interleaved with comments by Seebohm, or annotated copies of his works, and would be willing to share the information that these items contain, please contact him: Dr Tim Milsom (e-mail tpmilsom@btinternet.com), Orchard House, Flawith, York YO61 1SF, UK.

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Rediscovery of the Critically Endangered Banggai Crow *Corvus unicolor* on Peleng Island, Indonesia, part 1: ecology

by Mochamad Indrawan, Yunus Masala, Dadang Dwiputra, Fachry Nur Mallo, Ayub Maleso, Agus Salim, Frangky Masala, Idris Tinulele, Leffrendy Pesik, Daniel Simson Katiandagho & Sunosol

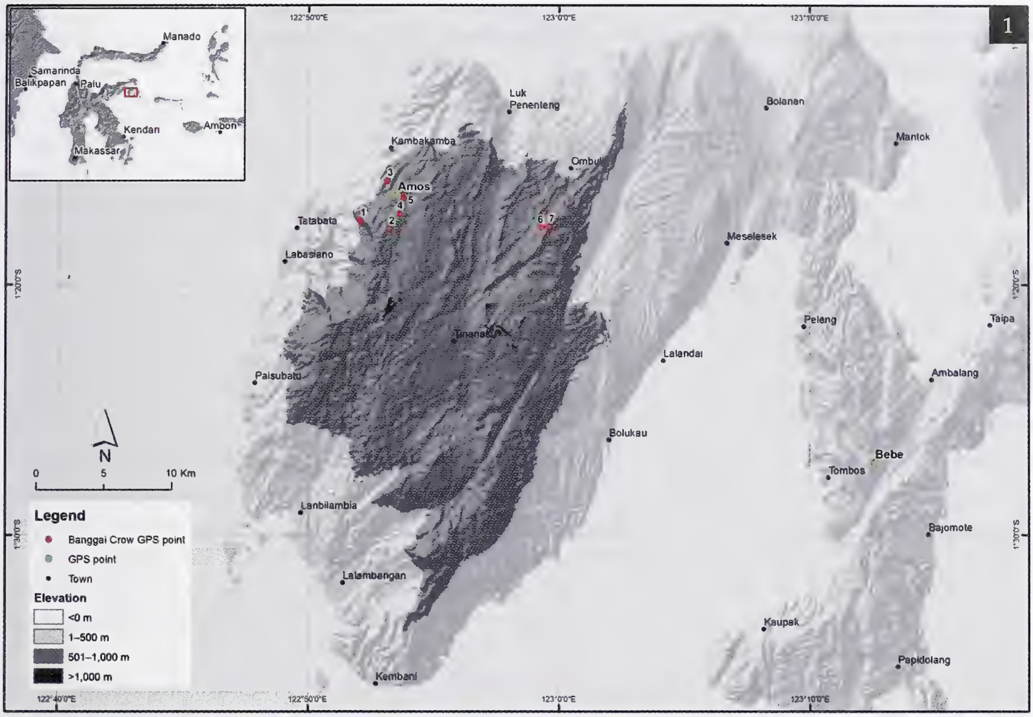
Received 31 March 2009; final revision accepted 9 May 2010

Summary.—Following searches initiated in 1991, the Critically Endangered Banggai Crow *Corvus unicolor*, a species previously known solely from specimens, was rediscovered in 2004. It has proved to be a primarily a forest bird on Peleng, where a healthy population occurs in the island's montane west, principally at 500–900 m, with another population in the lowlands of the island's central isthmus. Banggai Crow's behaviour and ecology are similar to those of Piping Crow *C. typicus*. Slender-billed Crow *C. enca*, a potential competitor, appears to be segregated by habitat and perhaps altitude. Nest trees were tall forest species including a Bombaceae, a *Calophyllum* sp., a *Canarium* sp. and a *Palaquium* sp. The conservation prospects for Banggai Crow are discussed.

Banggai Crow *Corvus unicolor* was described from two specimens collected by native hunters, at an unspecified locality in the 'Banggai, Sula Islands', Indonesia (Hartert 1919). Subsequently, in November 1991, YM & LP briefly observed a lone bird in montane forest on western Peleng (Indrawan *et al.* 1997), the first indication of its survival in the wild. Assuming a tiny population (based on the lack of recent records) and rates of habitat loss, Banggai Crow was classed as Critically Endangered (BirdLife International 2001, 2005, 2008). Following the species' definite rediscovery in 2004 (Indrawan & Masala 2007, Masala *et al.* 2008, Mallo *et al.* 2010), our main aim became to research its ecology and review its conservation status. Another, apparently smaller, population was discovered two years later by Celebes Bird Club (CBC) in the central isthmus of Peleng (CBC 2006, 2007, 2008, Mallo *et al.* 2010).

Study area and Methods

The general geography and ecology of the Banggai Islands, and the neighbouring Sula Islands, have been described elsewhere (ICBP 1992, Indrawan *et al.* 1993, Davidson *et al.* 1994, Sujatnika *et al.* 1996). The Banggai archipelago, which shares many biogeographic affinities with mainland Sulawesi, is named after the second-largest island (265 km^2), but Peleng (at 2,325 km^2) is the largest island. The islands are predominantly low-lying, comprised to a large extent of coralline limestone, and vegetated by mosaics of mixed gardens and moist forests at various stages of disturbance. Only western Peleng reaches altitudes in excess of 500 m, with remnants of pre-humid forest ranging from lowland to montane and subalpine; with increasing altitude the forests become less degraded. CBC (2008) found that central and eastern Peleng (which has undulating to hilly terrain) has more topsoil than the western part, supporting lowland forest trees including figs (*Ficus* spp.), as well as *Canarium* spp., *Pigafetta filaris, Lithocarpus havilandii, L. glutinosus, Shorea koordersii, Pometia* sp., *Macaranga* spp., *Gnetum gnemon, Trema orientalis* and a *Mangifera* sp.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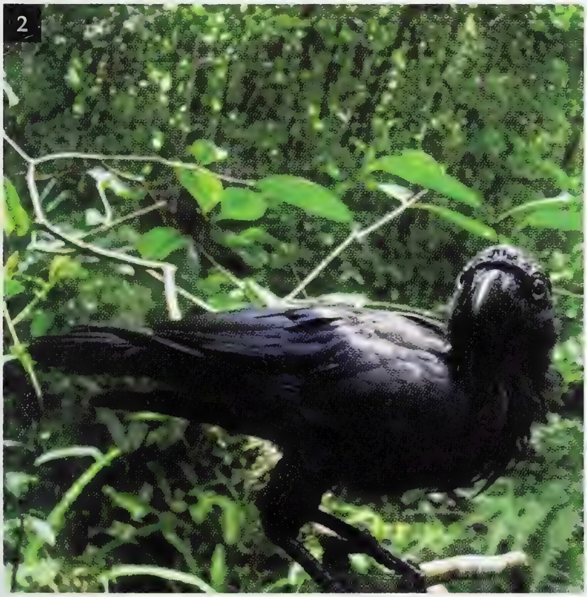

Figure 1. Map of the Banggai Islands, including Peleng (main study localities: two in western Peleng and one in the central isthmus; based on SRTM 90m Shuttle Radar Topographic Mission (Farr *et al.* 2007).

Figure 2. Banggai Crow *Corvus unicolor*, Peleng, Indonesia, 26 January 2008 (Frangky Masala).

Figure 3. Habitat of Banggai Crow *Corvus unicolor*, Peleng, Indonesia (Mochamad Indrawan)

At 800–900 m western Peleng supports typical montane life forms such as lichens, pandans, epiphytes and bryophytes. The forest trees, though not necessarily obligate montane flora, include commercially valuable timber such as a Bombaceae, a *Palaquium* sp., various oaks (*Lithocarpus* spp.), a *Calophylum* sp., *Canarium* spp., a *Syzigium* sp. and a *Podocarpus* sp. The forests do not appear to offer much fruit availability. Common fruiting trees included a *Myristica* sp., a *Syzigium* sp. and an unknown tree species.

Slash-and-burn cultivation is practiced, with *ladangs* of yam, taro and legumes.

Climatic data from the nearby mainland *c*.40 km away (Bubung-Luwuk meteorological station, unpubl. data 1996–2006; M. Sakey pers. comm.) suggest that the wet season generally occupies March to July, with 66–235 mm of rainfall. The dry season, which usually lasts September–November is marked by monthly rainfall of 14–23 mm. Rainfall peaks mainly in June, with a smaller peak in March.

On 2–7 October 2004, 12 September–11 October 2006, and 27 April–17 May 2007 expeditions were mounted to locate the crow, by MI & I. Tinulele (IT); MI, YM, AM & FM; MI, YM, AM, FM & D. S. Katiandagho (DSK), respectively. Available evidence suggested that crows seen in the lowlands in 1981 (Bishop 1992), and subsequently found to be widespread (Indrawan *et al*. 1997) were probably Slender-billed Crows *Corvus enca*, so searches were concentrated mainly at *c*.500–900 m, especially above Tetendeng, in the montane west of the island (= Peleng Mountains) where a putative Banggai Crow was reported in 1991 (Indrawan *et al*. 1997, Indrawan & Masala 2007). Rapid visits were also made to Alani, at *c*.400–500 m, in the western Peleng Mountains (7 October 2004), Bombolon, in the eastern Peleng Mountains (01°13′39″S, 123°03′43″E; *c*.250 m; 11 October 2006), and to the southern Peleng Mountains between Alul and Kramat (01°18′48″S, 123°03′36″E and 01°17′44″S, 122°59′18″E, respectively; 150–900 m; 1–7 May 2007).

Further ecological data were gained during complementary field studies by CBC, conducted mainly on the central peninsula of the island, especially at Bebe (Liang subdistrict, 01°26′69″S, 123°12′36″E; 320 m), on 29 October–2 November 2006, 24 July 2007, and 21–25 March 2008.

Interviews with local farmers and hunters recruited as guides were also conducted to record additional anecdotal data concerning the species.

Field identification and vocalisations

Examination of Banggai Crows in the hand was possible as follows (location, observers and dates in brackets): one dead bird recently shot by two local hunters (YM & FM, Amos, 14 May 2007), two specimens collected with assistance of local people (CBC, Bebe, 16 and 22 August 2007) and deposited at the Museum Zoologicum Bogoriense, Cibinong (MZB); and a bird mist-netted, measured, photographed and released (YM & FM, Supit, 26 January 2008).

Field identification was based on plumage, size, as well as vocalisations and, to a lesser extent, behaviour and ecology. Examination of specimens and photographs revealed that the pale grey, rather large irides, the larger but relatively short bill, and very short wings and tail are also useful identification features (P. C. Rasmussen *in litt*. 2009).

In the field, Banggai Crow appears a small crow with generally slaty black plumage and a dull brown sheen. Compared to Slender-billed Crow, it generally appears more streamlined (and thus smaller), although there is the potential for size overlap between the two. As observed twice in different locations, Banggai Crow when perched can even resemble Common Cicadabird *Coracina tenuirostris* in both shape and posture, though the cicadabird is smaller and has a less heavy bill.

In good light, the mantle to shoulder possesses a dull brown sheen, and once a brownish sheen was also visible on the neck. Unlike Slender-billed Crow, the species lacks any readily visible violet / purplish gloss. Whereas the neck and underparts frequently appear slaty (i.e. dull), the head, throat, breast and abdomen are black, and in good light there can appear to be a darker facial mask. In the field, it has an apparently dark iris, and black heavy bill, with dark feet and claws. The primaries and trailing edge of the wings are slaty black. The tail is short, and when perched is almost wholly concealed by the folded wings; once, there appeared to be a gap of 1–2 cm between the edges of the folded wings and the tail. These proportions differentiate it from Slender-billed Crow, which according to Goodwin (1976) is relatively longer tailed.

Our observations, especially of the brown tinge on the mantle and the tail proportions matched the species' depiction in Coates & Bishop (1997) quite closely. The quality of the brown sheen matched that of the syntypes at the American Museum of Natural History, New York (photograph courtesy of N. J. Collar), although the brown appeared more extensive and reached the underparts in the latter. The type description mentioned that 'the upperside has a fine purplish-blue, strongest on the wings and crown while the hind-neck, chest, breast, and abdomen (which are white in *G. typica*) are duller and more brownish slaty black' (Rothschild & Hartert 1900). Although the purplish-blue tinge was not readily observed in the field, once a dull blue-greenish tinge was observed to the shoulder. The dull brown sheen was less readily observed in juveniles. In two different individuals, the plumage appeared dark and even to have a slightly bluish sheen.

The flight is swift, whistling and direct, resembling that of Piping Crow *Corvus typicus* (Goodwin 1976). Compared to Slender-billed Crow, Banggai Crow more likely keeps to the canopy and changes perches with a quick, agile manner. Like *C. enca*, the whirring of its wings can be heard when close, albeit less readily so, though it still serves as a good clue for detection in more closed forests. The species is highly active, rarely keeping still and thus appears nervous. Only three times were birds observed on exposed perches for 2–8 minutes, always at distances of 100–300 m.

Prolonged close observations are difficult, as the species is highly wary, especially if approached by observers. However, once a bird circled the observer while making harsh calls, as if mock-attacking an intruder, not unlike a Piping Crow mobbing stationary human observers (IT, 4 October 2004).

Banggai Crow vocalises mainly in the morning, on leaving the roosts, as well as in the afternoons. Calls are uttered both perched and in flight. They are relatively vocal, e.g. on 5 October 2006, at 06.00–07.00 h, two exchanged calls at a rate of up to 8–12 phrases / minute. Bouts may last up to *c*.20 minutes. Thus, calls are useful for detection.

Birds in a group give a 3–4-note creaking whistle *kruik, kruik, kruik, kruik* (lasting 2–3 seconds), which at close range sounds like nasal screams, and apparently serves as a contact call emitted both in flight and perched, and was termed type 1. Once, type 1 was emitted with the bill opened half its width. The main call also included a whistled double *kriuuk …kruiik*, which lasts *c*.0.8–1.5 seconds and is apparently given most frequently in flight. Although probably a shortened variation of type 1, it is termed type 2. Birds in threes and fours appear to more readily vocalise than in one or twos, giving type 1 and type 2 calls, respectively. Sometimes, type 1 calls are immediately followed by a melodious whistle, a two-note phrase initially descending then ascending, *whu, weeeeeeee* (lasting 2–3 seconds). This is the type 3 call, and occasionally it was initiated with a single metallic note, *tong*. Variations included strophes of creaking and trilling notes. Juveniles gave a repeated soft cawing *wree-eek* (*c*.0.8–1.0 second), which may be a contact / alarm call, and is termed type 4.

The whistled main calls and nasal screams of Banggai Crow are not unlike those of Piping Crow (IT pers. obs.; http://homepage.mac.com/alanwilkinson/birding/sulawesi/grf/pipingcrow.mov). But, those of Piping Crow are apparently higher pitched, more upslurred, with the last element ascending sharply and perhaps harsher. The type 3 call of

TABLE 1

Sightings of Banggai Crow *Corvus unicolor* in western Peleng in 2004 and 2006. Encounters believed to involve the repeat detection of a previously seen bird are not listed

Date (observer/s in brackets)	Time / duration of sightings	No. of birds	No. of juveniles	Behaviour	Habitat	GPS reference[1]	Location	Notes
03/10/04 & 04/10/04 (IT)	*c.*15.00 h; 1–2 minutes; two consecutive days	1	none	Moving through spring area	Border of cultivation / secondary forest	1	Kokolomboi (01°17′28.2″S, 122°52′04.5″E); 539 m	Probably the same bird
04/10/04 (MI)	06.10 h; 30 seconds	4	unknown	Flew from roosting area to forested lower slopes of mountain, probably to forage	Border of cultivation / secondary forest	2	Laheme (01°17′47.7″S, 122°53′12.6″E); 844 m	
04/10/04 (MI)	*c.*08.40 h; 20 seconds	3	1	Foraging at forest edge	Secondary forest		Laheme	
05/10/04 (MI)	05.40 h; 2 minutes	2	unknown	Seen in the canopy of tall isolated roost trees just after sunrise, at a distance of *c.*200 m	Border of cultivation / secondary forest		Laheme	
05/10/04 (AM & MI)	08.30–10.30 h; 30–60 seconds each group	12 (three groups of four)	2 in each group	Apparently three different pairs with two fledglings each briefly seen in forest	Secondary forest		Laheme	
21/09/06 (YM & FM)	07.15 h; *c.*10 seconds	1		Moving away in heavy mist	Border of cultivation / secondary forest		Kokolomboi	
21/09/06 (YM & FM)	15.45–15.50 h; 2 minutes	4	2	Fed and moved through canopy, 10–20 m above ground	Primary forest		Sabol	
22/09/06 (YM & FM)	10.00 h	-	-				Sabol	Four unoccupied nests
22/09/06 (YM & FM)	08.10 h; *c.*30 seconds	2	unknown	Moving through canopy, 10–15 m above ground	Secondary forest		Sabol	
22/09/06 (YM & FM)	08.20 h; 30 seconds	2	unknown	Moving through area	Secondary forest		Sabol	*c.*600 m from previous observation

TABLE 1 (cont.)

23/09/06 (YM)	*c*.10.00 h	1					Sabol	Bird not seen
02/10/06 (MI)	-	-	-		Secondary forest	3	Momos (01°15′52.5″S, 122°53′09.3″E); 531 m	Four unoccupied nests
04/10/06 (MI)	*c*.10.30 h; 2 minutes	3	1	Foraging: the juvenile perched lower (7–10 m above ground), and even came to the ground; preening and flying conspicuously among trees; the young appeared quite trusting	Secondary forest	4	Pasuyasi (01°17′11.5″S, 122°53′39.3″E); 792 m	Group never seen well due to nervous behaviour, but stayed 1 hour, before leaving.
05/10/06 (MI)	06.30–06.35 h; 5 minutes	2	unknown	One bird sunning and preening for *c*.5 minutes on exposed dry branches *c*.20 m above ground; the other was detected only by calls		5	Bobonggon (01°16′34.3″S, 122°53′47.3″E); 519 m	
05/10/06 (MI)	07.22 h	-	-	A call heard, apparently from a different bird to the group earlier same day	Secondary forest		Bobonggon; *c*.650 m	
05/10/06 (MI)	16.00 h	4	unknown	Moved quickly through forest canopy	Primary forest		Near Amos (01°16′39.1″S, 122°54′26.2″E); 818 m	
05/10/06 (MI)	17.30–17.40 h; 3 minutes	3	unknown	Moving and calling in canopy, initially heard within forest (17.10–17.30 h), before coming into open (17.30–17.40 h) and they probably roosted at the border of cultivation / forest	Secondary forest		Amos (01°16′28.1″S, 122°53′33.7″E); 697 m	
05/10/06 (MI)	17.40–17.50 h; 1 minute	2	unknown	Calling, one from exposed perch, the other inside canopy	Border of cultivation / secondary forest		Amos	300 m south of previous group

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[1] Grid reference nos. 1–5 correspond to Fig. 1. Nos. 6–7 correspond to 01°17′44.14″S, 122°59′18.95″E, and 01°17′42.85″S, 122°59′35.59″E, respectively. Observations at these latter two points were not tabulated because they were made on 1–7 May 2007, i.e. outside the period covered by the table.

Banggai Crow also sounds like that of Piping Crow, although the last note is shorter than that of Piping Crow (IT pers. obs.). The calls of Banggai and Piping Crows differ from those of Slender-billed Crow in both the rest of the Banggai Islands and the nearby mainland, i.e. the southern part of Sulawesi's eastern peninsula, which is a simple caw ending sometimes in a falsetto (Indrawan *et al.* 1997).

The calls of Banggai Crow, especially type 2, are imitated by Hair-crested Drongo *Dicrurus hottentottus*. However, the imitations are usually followed by strophes of typical drongo calls including harsh and high-pitched metallic note(s), and therefore can be separated with care.

Results

Distribution.—The species is well known to local people of western Peleng, who gave it a local name, the onomatopoetic 'Kuyak', and are confident in differentiating its calls from those of Slender-billed Crow, whose vernacular name 'Pak-pak' is also onomatopoetic. They gave a detailed description of its morphology ('smaller-sized crow') and behaviour-ecology ('montane forest bird'), suggested that it is locally abundant, and eventually helped us locate the bird's main haunts. In general, Banggai Crow occurs in forested areas, as well as mosaics of forest and cultivation, but not wholly deforested areas. The species' overall altitudinal range on western Peleng, 500–900 m, corresponds to the lower montane to upper montane forest zones (DSK & MI pers. obs.).

Multiple encounters of birds in groups of up to four, especially at higher altitudes, are presented in Table 1. On the edge of forest at Luk Panenteng (01°13′00.7″S, 122°58′22.6″E; *c*.15 m), local farmers reported the species two days prior to our visit, but this is unconfirmed. Due to the brevity of our visit to the westernmost mountains, at Alani (7 October 2004), no sightings were made. However, local people are apparently familiar with the species. Slender-billed Crow was encountered mainly up to 400 m (with a single observation of one at *c*.900 m; *cf.* Mallo *et al.* 2010). Overall, westernmost Peleng is heavily deforested and it is unlikely that Banggai Crow is abundant there. The central and easternmost part of western Peleng is more forested, including at Luk Panenteng and Alul-Kramat near the south coast. Banggai Crow is well known to many local farmers and hunters there.

Many sightings were obtained at the main study sites in the western part of western Peleng, namely at Laheme and Bobonggon. At Laheme, apparently three different pairs, each with two fledglings, were briefly encountered in forest at *c*.700–900 m (AM & MI, 5 October 2004). At Bobonggon, along a transect of *c*.2.6 km, at least 12 birds were detected (5 October 2004). Above Tetendeng village we therefore estimated 32–50 birds within a radius of 3–4 km. A transect of *c*.4 km on the forested upper montane slope of Kramat-Alul suggested that *c*.5 groups (of 15–25 birds) may occur.

A branch nester, nests of Banggai Crow were found at three locations (Table 2). Nest trees were tall forest species (*c*.12–30 m tall) including Bombaceae, *Calophyllum*, *Canarium*, *Palaquium*, and other unidentified trees. Nest trees were either emergents or at least fairly isolated from their neighbours. Frequently, nests were placed on branches facing east. On a given tree 1–7 nests were found. Nests were always clustered in ones or twos, frequently on main stems, and within the topmost two-thirds of the canopy.

Discussion

Relative abundance.—As initially indicated by local information, we found Banggai Crow to be locally abundant, especially in montane western Peleng (Table 1). Observations suggest that Banggai Crow occurs mainly at higher altitudes (500–900 m) with heavy forest

TABLE 2
Nests of Banggai Crow *Corvus unicolor* found in 2006 and 2007.

Date (observer name/s in brackets)	Location	Habitat	Nest tree	Diameter at breast height of nest tree	No. of nests per tree	Nearby nesting tree	Notes
22/09/06 (YM & FM)	Sabol	Primary forest	*Palaquium* sp.		4	None	Apparently unoccupied nests of varying ages.
02/10/06 06/10/06 09/10/06 (MI)	Momos	Secondary forest	Bombaceae	*c.*20 cm	3	Two trees *c.*15 m apart	No birds seen at the nests but local people indicated that one was last seen at a nest on 30 September and that one was seen on the same tree after we left. Nest revisited on 6 October (05.30–06.00 h) and 9 October (18.00–19.00 h) but no birds seen. On 6 October, a crow was flushed from the canopy, but no conclusive evidence of nest being active. Direct inspection was not undertaken for fear of disturbance.
			Calophyllum	*c.*15 cm	1		
02/05/07 (MI)	Alul-Kramat	Primary forest *c.*700–900 m	*Myristica* sp.	*c.*25 cm	5	None	Apparently unoccupied nests of varying ages.
			Canarium sp.	*c.*15 cm	1		
			unidentified	*c.*20 cm	2	Two trees only *c.*7 m apart	
02/05/07 (MI)			unidentified	*c.*40 cm	7		Apparently unoccupied nests of varying ages.
02/05/07 (SK)			unidentified		1		Emergent tree.
02/05/07 (MI)	Kramat (near summit)	Primary forest *c.*800 m	unidentified	*c.*25 cm	2	None	Apparently unoccupied nests of varying ages; emergent tree.
15/05/07 17/05/07 (YM & FM)	Amos	Secondary forest	unidentified	10 cm	1	Two trees *c.*500 m apart	Active nest tended by 2 birds, with 1 egg.
			unidentified	15 cm	6		Active nest tended by 1 bird, with 3 eggs.
29/06/07 (via AM)	Buta Banggong	unknown	unidentified	-	-		Active nest, with 3 eggs.

cover, which, except for a previous three-day visit by YM & LP (Indrawan *et al.* 1997), have been little explored hitherto. On western Peleng, Banggai Crow is not common in the lowlands (although CBC found otherwise in the central isthmus). Based on previous surveys, including an archipelago-wide search in 1991 (Indrawan *et al.* 1993, 1997), it is unlikely that the species occurs in any numbers elsewhere on the Banggai group's larger islands, or even away from montane western Peleng and the central isthmus, meaning that it has a very small range (Indrawan *et al.* 1997, Indrawan & Masala 2007, CBC 2008, Mallo *et al.* 2010).

Local hunters on western Peleng estimated up to 50 birds in a 3–4-km radius. However, care must be taken in extrapolating local densities across the species' available altitudinal range and habitat, because not all montane habitats support the crow. Based on our observations and local reports, we estimated that in the western Peleng Mountains Banggai Crow numbers 50–200 individuals, and YM estimated there may be close to 500 birds throughout western Peleng.

While the crow nests in tall trees, at risk of clearance, we encouragingly observed relatively frequent fledglings and juveniles in 2004, 2006 and 2007, indicating active recruitment.

Breeding biology.—Mostly unoccupied (probably abandoned) nests were observed in September–October 2006 and April–May 2007 (Table 2). The crow apparently nests at least once p.a., during and / or at the end of the wet season, i.e. during our 2006 and 2007 surveys in August–September and in May–June, respectively. Despite that *Lithocarpus* spp. are among the locally dominant trees, their use for nesting was not seen by us, but a local person informed us that he had seen them being used once or twice (A. Lumano pers. comm.). It is unknown why these trees are not habitually used; perhaps their architecture or ant commensalism discouraged their use by Banggai Crows for nesting.

The number of nests probably depends on the size of the nesting tree. Nests were of different ages. Based on the colour and relative decay of the dried sticks, the older nests appeared darker whereas recently constructed nests are whitish. It is unknown if different nests on the same tree were used simultaneously, but based on the age of the sticks used it seems more likely that they were consecutively constructed in different seasons. Furthermore, the closest nest trees were usually 100–200 m apart, suggesting the species is probably not a colonial nester.

Nests were constructed of relatively sparse dry sticks and branches, in slightly depressed platforms or, occasionally, in the shape of a slightly inverted cone. The inner cup was more neatly lined with finer branches and twigs. The nest's form resembles that of Slender-billed Crow in the Banggai group (MI & YM pers. obs.), but the latter's nests are larger, and constructed of larger sticks. Nests of Banggai Crow resemble those of Green Imperial Pigeon *Ducula aenea* in size (but the latter is a platform of much sparser and thinner branches), whereas nests of Slender-billed Crow are as large as those of Brahminy Kite *Haliastur indus* but less cup-shaped than the latter (YM & MI pers. obs.).

A local farmer in Alani reported finding a nest in a 'Kayu Tomoni' tree (scientific name unknown) which contained a single nestling (July 2004). A local report was also received of a nest with three eggs on 29 June 2007, at Buta Banggong (A. Maleso pers. comm.).

Two active nests *c*.0.5 km apart were observed on 15 and 17 May 2007, at Amos (YM & FM). At the first, a bird was seen on the nest warily observing its surroundings. Its partner perched nearby, *c*.10 m away. During the 20-minute observation, the birds were almost silent, with the non-brooding individual calling just once. The second active nest was on a tree with six nests on it. When approached, a single Banggai Crow silently made circular flights twice around the nest, then left. Five minutes later a call was heard nearby. The two nests held one and three eggs, respectively, which were white, fairly heavily marked with faint purple to grey spots, and sparse bold speckles of brown.

Detecting the species would probably be easier in July–September (post-wet season) when fledglings are barely able to fly and effectively restrict the movements of the adults. *C. unicolor*, like many other crows, is gregarious and apparently travels in family parties. In October 2004 and September–October 2006, juveniles were still with the adults. During one observation, on 4 October 2004, a fledgling was fed arthropods (Sunosol pers. obs.).

Ecology.—The apparently regular distribution of Banggai Crow indicates that the species maintains group territories. However, our observations reveal that birds regularly descend the slopes and cover large areas, suggesting that their home range may be extensive. Like most passerines, Banggai Crow is active during the early morning and late afternoon. Calls were heard just after sunrise, and two birds were seen in the canopy of tall isolated roost trees at a *ladang* abutting forest edge, at *c.*900 m (MI, 5 October 2004). Early morning is sometimes used for prolonged sunning and preening on bare branches (MI pers. obs.). In mid to late morning, the birds move in threes and fours from the roost areas to the forested lower slopes, to forage (MI pers. obs.). In the afternoon they gradually approach the roost sites in loose family parties, with more calling. When foraging, the crow frequently keeps to the upper canopy, whereas in the midday hours they stay in the mid canopy. Trees that are frequently used are those with some leaves. It roosts in emergents and tall trees in the forest and forest edge. The birds appear less inclined to cross wide open areas, especially compared to Slender-billed Crow. On the infrequent occasions that crows were observed flying above the canopy to cover longer distances, they followed valley contours.

In the absence of farmers, *C. unicolor* may forage in *ladang* dry-land cultivation and perch just 1–3 m above ground (MI pers. obs.). However, in places where inhabitants use airguns, e.g. Kokolomboi, the crow did not appear 'habituated' and spent even less time on individual perches. At Bobonggon, where airguns are rare, they appeared to spend longer perched. At both sites, the local community attributed difficulties in making prolonged observations to the crow's intelligence and wariness (B. Maddus pers. comm.).

It is sometimes possible to follow birds while foraging. At the forest edge in the subvillage of Kokolomboi, at *c.*500 m, one bird was encountered repeatedly at the same location. In another observation, a family of three, actively foraging and fluttering between trees appeared to remain in the same area for at least one hour in late morning.

Given the relative scarcity of fruits, we hypothesise that the main food of Banggai Crow is probably arthropods, which may also explain its relatively smaller size. Local hunters report that the bird takes winged isopteran termites.

Our general observations of behaviour, especially the whistled call, and preference for forested canopies, nervousness, as well as observer-mobbing suggest that the species is more closely related to *C. typicus* than to *C. enca* (see Mallo *et al.* 2010).

Our data support BirdLife International's (2001) assessment that Slender-billed Crow has become dominant in more disturbed habitats, especially in the lowlands. The highest recorded altitude of *C. enca*, 400 m at Alani, appears to lie below that of Banggai Crow, and they may be altitudinally segregated. It is unknown, however, how much lower Banggai Crow ranged in prior decades. On western Peleng, Banggai Crow is reported to have occurred near sea level *c.*40 years ago (AM pers. obs).

Threats.—Conversion of montane forest to meet the demand for agricultural land for the increasing human population constitutes one of the main threats to the species. Forest conversion to shifting cultivation is a potential threat because conversion will reduce available habitat for the Banggai Crow, but will also pave the way for Slender-billed Crow to extend its range. Although subsistence hunting occurs, and airguns are increasingly used, there is no systematic demand on the crow. Some farmers believe the crow is a minor pest because it is assumed to take poultry eggs. However, this seems very unlikely, given the crow's range, which calls for clarification of the crow's behaviour.

Conservation.—The status of Banggai Crow was re-evaluated using data from our surveys. Based on known records and projected range within suitable habitat, the species has an estimated Extent of Occurrence (EOO) of *c.*494 and 209 km^2 in the west of the island and central isthmus, respectively. The area, extent and quality of habitat within this range is declining meaning the species is Endangered under criterion B1a+b(iii) (i.e. an EOO of <5,000 km^2 at a single location and declining). The survey also projected that the area, extent and quality of habitat are likely to decrease even further due to conversion and over-exploitation of resources. Because altitudinal range expansion by Slender-billed Crow could pose a direct threat to Banggai Crow, *in situ* conservation of the latter should include monitoring of Slender-billed Crow as a potential competitor

Our limited interviews suggested that local community members could feel pride in the unique existence of Banggai Crow in their regions. Although the crow is considered a minor pest, several local farmers are interested in its conservation. Thus conservation measures should be designed as bottom-up processes beginning with local farmers (and hunters). Use of the vernacular name 'Kuyak' may instill local pride, and assist conservation efforts. To develop local awareness, local people should be involved in research, including into the crow's diet, in order to establish that it is not an egg predator.

Habitat protection is of high priority. Reserves should be developed in conjunction with community-based forest protection, but are possible only through agreements between regional (=district) government and local communities concerning land use. It is more rational to realise community agreement, through traditional 'adat' laws, before establishing regional regulations to protect the forests.

In the long run, ecotourism could contribute to the economic value of the species and its habitat. However, birdwatchers must be sensitive to local culture, especially as the crow's main range is surrounded by isolated communities whose members do not necessarily speak the national language. For instance, in our experience, even casual birdwatching can give rise to conflict, which could be counterproductive to the species' conservation. It is recommended that visits include not only birdwatching but also work with local stakeholders to ensure two-way communication and effective sharing of benefits, whether material, knowledge, or beyond.

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Rediscovery of the Critically Endangered Banggai Crow *Corvus unicolor* on Peleng Island, Indonesia, part 2: taxonomy

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Summary.—Since its description in 1900, the Banggai Crow *Corvus unicolor* has been known solely from two specimens of questionable provenance. The taxon has sometimes been considered a subspecies of Slender-billed Crow *Corvus enca*, but is currently treated as a Critically Endangered species, and has been considered possibly extinct. Recent field work has been undertaken in the Banggai Islands on crows thought to be *C. unicolor*, but the presence of *C. enca* there precluded certain field identification. The collection of two specimens on Peleng Island in 2007 enabled morphological comparisons with the syntypes and unequivocally corroborates the continued existence of the Banggai Crow, as do recent field observations. Here we show that the 2007 Peleng birds are the same taxon as the syntypes of *C. unicolor*, designate a lectotype, provide new data on the morphological and vocal characteristics of *C. unicolor*, and demonstrate that *C. unicolor* is certainly not a subspecies of *C. enca*. We recommend that *C. unicolor* is best treated as a distinct species under the Biological Species Concept.

Banggai Crow *Corvus unicolor* (Fig. 5) has been known for over a century only from two specimens. Although some sources have indicated that the type specimens were from Banggai Island, one of the main islands in the Banggai Islands (Madge & Burn 1994, Dickinson 2005; Fig. 1), the provenance of the syntypes of *C. unicolor* has never been satisfactorily resolved, and indeed the species' continued existence has been doubted. Several authors have followed Vaurie (1958) in considering *C. unicolor* a subspecies of Slender-billed Crow *C. enca*, while Dorst (1947) treated *C. unicolor* as a subspecies of Piping Crow *C. typicus*. Although most recent authors (e.g. Inskipp *et al.* 1996) have followed Goodwin (1976) in considering *C. unicolor* a species, the taxonomic status of *C. unicolor* remains equivocal.

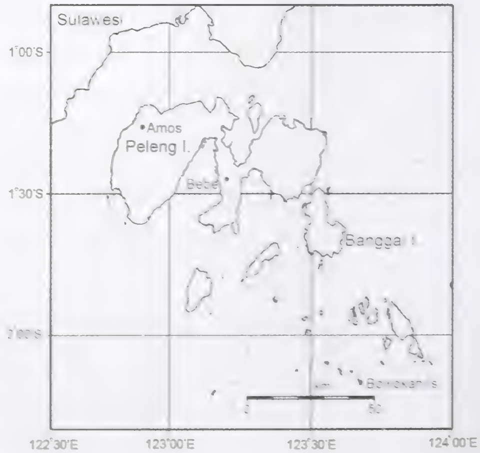

Figure 1. Map of the Banggai Islands showing localities mentioned in the text.

Rothschild & Hartert (1900) described two unsexed crow specimens in a collection made by natives on 'Banggai, Sula Islands' as a new species *Gazzola unicolor*. Subsequently, Hartert attempted to fix one as the type by tying a Rothschild type label on the specimen (M. LeCroy *in litt.* 2009), and he (Hartert

1919) wrote that in 1900 the Tring Museum 'received a number of well-prepared skins, collected by natives, from Mr. van Renesse van Duivenbode. They were said to come from Banggai in the Sula group, east of Celebes' (Fig. 1), and that '[a]mong these skins were the two specimens of *Gazzola unicolor* . . . '. Hartert (1919) further claimed that '[t]hough the localities of skins from this source are often doubtful and incorrect, the locality must have been correct this time, as shown by certain other species and subspecies.' Meinertzhagen (1926) stated they 'appear to be 'trade' skins prepared by natives, neither having any reliable data attached'; however, the specimens are not trade skins but well-made skins prepared by Duivenbode's trained local collectors (M. LeCroy *in litt*. 2009). Neither of the two syntypes (AMNH 673966, 673967), which came to the American Museum of Natural History (New York) as part of the Rothschild Collection, have original collector's labels, and the date and locality of the two specimens is obscure. Although several collectors worked in the Banggai Islands (see Discussion), and a few recent observers have been there specifically seeking *C. unicolor* (although these observers did not venture high into the hill forests; Bishop 1992, King 2007), no further information about this enigmatic taxon has come to light since its description. This has led to speculation that the species might be extinct (Madge & Burn 1994, Dickinson 2003). Owing to the lack of field observations and recent reports, Banggai Crow was assumed to have a very small population and was listed as Critically Endangered in the IUCN Red List of Threatened Species (BirdLife International 2006, 2007).

Ecological studies (Masala *et al*. 2008, Indrawan *et al*. 2010; Celebes Bird Club unpubl.) and very recent independent observations by F. Rheindt and PV in West Peleng in March and April 2009 have revealed the contemporary survival of the Banggai Crow in western Peleng, especially in the sub-districts of Buko, Bulagi and Liang. These studies have resulted in the first data on the behaviour, ecology, vocalisations and conservation status of Banggai Crow (Indrawan *et al*. 2010). Field identification of *Corvus unicolor* was based on plumage, size and vocalisations, and to a lesser extent behaviour and ecology (Indrawan *et al*. 2010). Two specimens were collected (see below) and are now in the Museum Zoologicum Bogoriense, Cibinong (MZB). However, although never reported by early explorers, crows provisionally considered to be an undetermined subspecies of Slender-billed Crow *C. enca* are evidently now widespread in disturbed lowlands of the Banggai Islands, which has led to doubts about the identification and diagnosability of *C. unicolor*, and hence its continued survival. *C. enca* was first recorded on both the islands of Peleng and Banggai in 1981 (Bishop 1992), and by 1991 was widespread with a nesting record as far south as the Bowokan Islands, between the main Banggai Islands and the Sula Islands (Indrawan *et al*. 1997). The lack of historic records may indicate that *C. enca* has recently colonised following anthropogenic habitat conversion. However this hypothesis requires further research considering that older villagers in Western Peleng claim that 'the big lowland crow' was also present in their childhood when disturbed forest dominated low elevations on Peleng (Rheindt *et al*. 2010).

Given that identification criteria diagnosing these all-black birds in the field are not well known and in the absence of knowledge of the vocalisations of the crows on Peleng, it has heretofore been problematic to provide unassailable evidence of the continued existence of Banggai Crow. This is largely because no specimens of *C. enca* are known from the Banggai Islands and because variation within this highly polytypic, widespread species is poorly documented. *C. e. celebensis* is the widely distributed subspecies of *C. enca* on Sulawesi and some neighbouring islands, whilst *C. e. mangoli* has been little-studied and was described from just two specimens (Vaurie 1958). No other taxa of *C. enca* closely approach the Banggai Islands. Although birds assigned to *C. enca* now occur commonly on the Banggai group, the lack of specimens means that we cannot yet definitively determine the subspecies there.

In addition to the free-living *C. unicolor* studied (Indrawan *et al.* 2010), we studied and measured four individuals in the hand. Here we show that these, and birds photographed and sound-recorded, unquestionably represent *C. unicolor*. As the original description (Rothschild & Hartert 1900) was brief and based on just two specimens, and subsequent descriptive notes have either not added much or have been contradictory, we provide additional descriptive details on the basis of our new material. We also re-evaluate the historical record of this species and its taxonomic status.

Methods

Because of their rarity, neither the AMNH nor MZB specimens could be borrowed for direct comparisons. Hence, PCR visited AMNH prior to her visit to MZB to photograph and measure the syntypes, and to determine which characters could be used to distinguish *C. unicolor* from the many races of *C. enca*, almost all of which are well represented at AMNH. Because only *C. e. celebensis* and *C. e. sulaensis* are known from the region, these two taxa were subject to the most detailed comparisons. At MZB, therefore, indirect comparisons could be made using the same methods and measurements taken by the same observer. Colour comparisons were made by PCR using designations in Smithe (1975) under fluorescent lighting at both AMNH and MZB. Colour comparisons with Smithe (1975) also made of the MZB birds, by MI, produced similar results, but those by PCR are used here because she studied both the AMNH and MZB specimens. Evidently because of the circumstances of capture, the new specimens are missing some feathers, particularly around the head; some plumage areas are soiled, some areas (e.g. the throat) have ruffled feathers; and the underparts of one of the new specimens are largely concealed by the wings, making colour comparisons of these plumage areas difficult.

Measurements were taken to the nearest 0.1 mm using digital callipers. Those of most specimens were taken by PCR, but a few *C. e. mangoli* specimens and two putative *C. unicolor* were measured by MI or, in the former case, taken from the literature (Vaurie 1958). Measurements taken included: longest rictal bristle; culmen from skull base; culmen ridge width, bill height, and bill width at distal edge of nares; gape width; wing (flattened); distance between tip of longest primary-covert and tip of primary 1 (p1; outermost); shortfalls from wingpoint of folded wing of each primary (pp1–10); tarsus; hindclaw (excluding scute); tail (from insertion point between central rectrices); and tail graduation (distance between tip of central rectrix and tip of outermost rectrix of folded tail). Univariate summary statistics and Principal Component Analysis were made using Systat 8.0. Principal Components Analysis (PCA) was used to determine which variables best explain variability in the data and which best separate the two species. For purposes of the PCA, specimens of *C. e. celebensis* and *C. e. mangoli* (*n*=4), as well as the two smallest races of *C. enca*, namely *C. e. pusillus* (*n*=3) and *C. e. samarensis* (*n*=1), were included in the analysis to determine if proportional differences exist in *C. unicolor* vs. disparate races of *C. enca*.

Field recordings were made by PV using an Edirol R-09HR field recorder with a Sennheiser ME-66 directional microphone, and sonograms were prepared using Raven Pro 1.3 (Cornell Laboratory of Ornithology). Field photographs were taken by PV using a Canon Eos 40D with a Canon EF 100–400 IS 4.5–5.6 telephoto lens.

Results

New specimens and records.—On 24 July 2007, two *C. unicolor* were taken alive at Bebe sub-village by Celebes Bird Club (CBC), but they perished on 16 and 22 August 2007 (an adult female and adult male respectively) and were then prepared as specimens. These were later donated by CBC through MI to MZB, so there are now four Banggai Crow specimens in museum collections worldwide (Table 1). Prior to the collection of the MZB specimens, a bird shot by a local hunter on 14 May 2007, in the vicinity of Amos village (Buko sub-district, 01°16′28.1″S, 122°53′33.7″E; 697 m) was measured and photographed by YM & F. Masala, but the bird could not be confiscated, and the measurements, which were made hurriedly, could not be double-checked. The wing measurement of this bird (which, as visible in photographs, is otherwise typical of *C. unicolor*) is so long that it must either have been measured or recorded erroneously. On 26 January 2008, another bird was caught, measured, photographed and released in the vicinity of Supit village (Buko sub-district), very near Amos.

While in the forested hills of western Peleng (in the vicinity of Tataba, on 22–31 March 2009 and 2–5 April), PV & F. Rheindt (during the former dates only) encountered several pairs and small groups of 2–4 birds at altitudes of 650–900 m.

Comparison of new specimens with syntypes of C. unicolor.—Colour comparisons of the MZB specimens with the AMNH syntypes are presented in Table 2. For those plumage areas in which comparisons were possible, colour differences were all minor. For soiled and / or ruffled plumage areas that did not lend themselves to close comparison, differences between the MZB and AMNH specimens were not apparent. Both of the new specimens show strongly grey feather bases, which in a few areas were judged to be of a slightly darker shade than in the syntypes (bearing in mind that direct comparisons were impossible). The two MZB Banggai Crow specimens from Peleng Island match the original description (Rothschild & Hartert 1900) in that the base of the feathers were strongly grey, rather than bright white as in *C. typicus*, *C. e. celebensis* and *C. e. mangoli*. The main colours of *C. unicolor* are Sepia (219), Sepia (119) and Dark Grayish Brown (20) (Smithe 1975), with a bluish sheen (Cyanine Blue 74) in more intense light (Table 3).

In measurements, the new MZB *C. unicolor* specimens clearly fit within the very limited range of variation of the two AMNH syntypes (Table 3). All the preserved specimens and the released individual share the diagnostically short wing; however, as mentioned above

TABLE 1

Specimens of Banggai Crow *Corvus unicolor* in existence in the world's museums as of 2009.

Museum	Number	Sex	Locality	Date	Elevation	Collector(s)	Field No.
AMNH	673966	?	Sula Islands (Banggai)	1900 or earlier	?	Unknown; sent by Duivenbode	None
AMNH	673967	?	(Banggai,) Sula Islands	1900 or earlier	?	Unknown; sent by Duivenbode	None
MZB	31.255	F	Bebe sub-village, Tombos village, Liang sub-district, Banggai Islands, Central Sulawesi (01°26′69.0″S, 123°12′36.27″E)	Captured 24 July 2007, died 16 August 2007	320 m	F. N. Mallo, D. Dwi Putra, Herlina, A. Rahman, I. N. Mallo	01
MZB	31.256	M	Bebe sub-village, Tombos village, Liang sub-district, Banggai Islands, Central Sulawesi (01°26′69.0″S, 123°12′36.27″E)	Captured 24 July 2007, died 22 August 2007	320 m	F. N. Mallo, D. Dwi Putra, Herlina, A. Rahman, I. N. Mallo	02

TABLE 2

Colour comparisons between syntypes and new specimens of Banggai Crow *Corvus unicolor*. Colour names follow Smithe (1975).

Area	AMNH 673966	AMNH 673967	MZB 31.255	MZB 31.256
central crown	black with slight iridescence closest to Color 173, Indigo blue	black with slight iridescence closest to Color 173, Indigo blue	too many feathers missing to judge	too many feathers missing to judge
ear-coverts	slightly glossy Color 89, Jet Black	slightly glossy Color 89, Jet Black	slightly glossy Color 89, Jet Black	slightly glossy Color 89, Jet Black
throat	slightly glossy Color 89, Jet Black	slightly glossy Color 89, Jet Black	feathers too ruffled or missing to judge	feathers too ruffled or missing to judge
centre of nape	dark brown, Color 20, Dark Grayish Brown	dark brown, Color 20, Dark Grayish Brown	dark brownish black, Color 119, Sepia	dark brownish black, Color 119, Sepia
central mantle	slightly glossy black, closest to but slightly blacker than Color 82, Blackish Neutral Gray	browner than AMNH 673966, Color 119, Sepia	matte black, Color 89, Jet Black	matte black, Color 89, Jet Black
scapulars	black with slight iridescence closest to Color 173, Indigo Blue	slightly glossy Color 119, Sepia	left: Color 82, Blackish Neutral Gray; right: Color 119A, Hair Brown	Color 89, Jet Black
side of neck	between Color 119, Sepia and Color 219, Sepia; darker than 219 but warmer than 119	between Color 119, Sepia, and Color 219, Sepia; darker than 219 but warmer than 119	brownish black, Color 119, Sepia	black, between 82, Blackish Neutral Gray and 89, Jet Black
tertials	black with slight iridescence closest to Color 173, Indigo Blue	slightly glossy Color 119, Sepia	Color 82, Blackish Neutral Gray	Color 89, Jet Black
uppertail-coverts	closest to Color 20, Dark Grayish Brown	closest to Color 20, Dark Grayish Brown	black, between Color 82, Blackish Neutral Gray and Color 89, Jet Black	black, between Color 82, Blackish Neutral Gray and Color 89, Jet Black
uppertail surface	slightly glossy Color 82, Blackish Neutral Gray	slightly glossy Color 82, Blackish Neutral Gray	slightly glossy Color 82, Blackish Neutral Gray	between Color 82, Blackish Neutral Gray and 89, Jet Black
central breast	slightly glossy Color 82, Blackish Neutral Gray	Color 19, Dusky Brown	slightly glossy Color 82, Blackish Neutral Gray	not visible due to preparation style
central belly	slightly glossy Color 82, Blackish Neutral Gray	Color 19, Dusky Brown	black, between Color 82, Blackish Neutral Gray and 89, Jet Black	Color 89, Jet Black
undertail-coverts	Color 82, Blackish Neutral Gray	Color 82, Blackish Neutral Gray	Color 82, Blackish Neutral Gray	Color 89, Jet Black
nape feather bases	medium grey, Color 85, Light Neutral Gray	medium grey, Color 85, Light Neutral Gray	medium grey, Color 84, Medium Neutral Gray	medium grey, Color 84, Medium Neutral Gray
mantle feather bases	medium grey (darker than nape base colour) Color 84, Medium Neutral Gray	medium grey (darker than nape base colour) Color 84, Medium Neutral Gray	medium grey (same as nape base colour) Color 84, Medium Neutral Gray	medium grey (same as nape base colour) Color 84, Medium Neutral Gray
uppertail-coverts feather bases	medium brownish grey, Color 79, Glaucous	Color 84, Medium Neutral Gray	medium brownish grey, Color 79, Glaucous	medium brownish grey, Color 79, Glaucous
central breast feather bases	rather pale grey Color 86, Pale Neutral Gray	rather pale grey Color 86, Pale Neutral Gray	Color 85, Light Neutral Gray	not visible due to preparation style
central belly feather bases	medium grey, Color 85, Light Neutral Gray	medium grey, Color 85, Light Neutral Gray	Color 84, Medium Neutral Gray	Color 83, Dark Neutral Gray

TABLE 3

Measurements (mm) of all known and putative Banggai Crow *Corvus unicolor* individuals.

Measurement	AMNH 673966 (syntype)	AMNH 673967 (syntype)	YM* (Bobonggon, 14 May 2007); specimen not saved	MZB 31.255; CBC (Bebe, 16 August 2007)	MZB 31.256; CBC (Bebe, 22 August 2007)	YM* (Sapit, 26 January 2008); released
Longest rictal bristles	15.2	15.6	–	11.3	10.4	–
Culmen from skull base	46.1	46.2	–	45.4	48.0	–
Culmen ridge width at distal edge of nares	7.3	6.3	–	7.1	6.8	–
Gape width	20.6	18.5	–	*c.*21.5	20.1	–
Bill height at distal nares	17.7	17.0	15.0	16.3	17.4	–
Bill width at distal nares	13.9	12.9	–	13	12.2	–
Wing length (flattened)	205	210	270**	206	206	209
Longest primary-covert to P1 tip	70	76	–	74	77	–
P1 shortfall	76	75	–	72	72	–
P2 shortfall	30	26	–	28	27	–
P3 shortfall	7	5	–	7	6	–
P4 shortfall	2	0	–	3	2	–
P5 shortfall	0	0	–	0	0	–
P6 shortfall	7	9	–	9	11	–
P7 shortfall	26	26	–	28	28	–
P8 shortfall	44	37	–	40	40	–
P9 shortfall	54	51	–	48	49	–
P10 shortfall	59	56	–	58	55	–
Tarsus length	45.9	40.9	45.0	41.6	42.1	45.0
Hindclaw l	15.4	14.5	–	11.8 (very worn)	13.1	–
Tail (from insertion)	103	108	–	111	114	100
Tail graduation	6	5	–	6 (slightly worn)	9	–

*Specimen not measured by PCR

**Measurement almost certainly incorrect; see text

the hunter-killed bird that was not preserved was recorded as having a much longer wing. Photographs of the latter bird, however, show that it shares other attributes of *C. unicolor*, in particular the grey feather bases.

The irides of the living *C. unicolor* were greyish white, as clearly shown in photographs taken of them while alive. In strong contrast, adult specimens examined at MZB of *C. enca* subspecies for which label data were recorded had the irides brown (two *C. e. compilator*, six *C. e. celebensis*) or coffee-brown (one from Kalidupa Island, another from Buton Island); dark blue (one *C. e. compilator*), or blue-black (two *C. e. compilator*). A young juvenile *C. e. celebensis* had the irides grey. At AMNH, most *C. enca* labels with iris colour indicated they were dark brown, while two were grey-brown, one light reddish brown, and one red (perhaps in error).

As regards age categories, AMNH 673966 is an adult based on its rounded rectrices, with fault bars that do not line up, and its less pointed / acute outer primaries 2–3 (numbered from outside inwards) than AMNH 673967. The latter (AMNH 673967) may be an immature, as its posterior underparts are slightly browner than in AMNH 673966; its

TABLE 4

Measurements (mm) of specimens of Banggai Crow *Corvus unicolor* and geographically proximate races of Slender-billed Crow *C. enca*, presented as mean ± SD (*n*). Primary shortfalls are tips of each primary (numbered ascendently) to wingpoint of folded wing.

Measurement	*C. unicolor* (all)	*C. enca celebensis*	*C. enca mangoli**
Longest rictal bristles	13.1 ± 2.6 (4)	21.5 ± 2.0 (23)	—
Culmen from skull base	46.3 ± 1.2 (4)	54.4 ± 2.8 (17)	55.4 ± 2.8 (7)
Culmen ridge width at distal edge of nares	6.9 ± 0.4 (4)	7.0 ± 0.5 (19)	6.6 ± 0.5 (4)
Gape width	19.7 ± 1.1 (3)	23.0 ± 1.4 (19)	22.6 ± 1.7 (4)
Bill height at distal nares	17.1 ± 0.6 (4)	17.7 ± 0.7 (16)	18.1 ± 1.7 (2)
Bill width at distal nares	13.0 ± 0.7 (4)	14.1 ± 0.6 (19)	13.6 ± 1.0 (4)
Wing length (flattened)	206.7 ± 2.2 (4)	279.6 ± 11.2 (18)	274.4 ± 13.4 (7)
Longest primary-covert to P1 tip	74.2 ± 3.1 (4)	114.5 ± 6.0 (15)	101.8 ± 4.8 (4)
P1 shortfall	66.2 ± 14.2 (4)	93.6 ± 6.6 (13)	99.0 ± 9.9 (4)
P2 shortfall	27.8 ± 1.7 (4)	29.1 ± 3.8 (13)	37.7 ± 2.6 (4)
P3 shortfall	6.3 ± 0.9 (4)	4.4 ± 2.3 (13)	8.8 ± 2.6 (4)
P4 shortfall	1.8 ± 1.3 (4)	0.3 ± 0.8 (13)	1.2 ± 2.5 (4)
P5 shortfall	0 (4)	1.3 ± 1.2 (12)	1.8 ± 1.3 (4)
P6 shortfall	9.0 ± 1.6 (4)	13.1 ± 4.0 (12)	14.8 ± 2.8 (4)
P7 shortfall	27.0 ± 1.2 (4)	41.2 ± 6.3 (10)	44.0 ± 5.4 (4)
P8 shortfall	40.2 ± 2.9 (4)	61.3 ± 8.6 (8)	58.5 ± 6.4 (2)
P9 shortfall	50.5 ± 2.6 (4)	75.0 ± 9.7 (8)	71.0 ± 7.1 (2)
P10 shortfall	57.0 ± 1.8 (4)	85.0 ± 9.9 (8)	82.5 ± 10.6 (2)
Tarsus length	42.6 ± 2.2 (4)	52.3 ± 2.4 (17)	48.5 ± 2.3 (4)
Hindclaw l	13.7 ± 1.6 (4)	17.3 ± 0.9 (18)	10.6 ± 0.7 (4)
Tail (from insertion)	108.9 ± 4.9 (4)	134.0 ± 5.6 (19)	127.7 ± 9.5 (7)
Tail graduation	6.0 ± 2.2 (4)	8.2 ± 5.1 (11)	5.8 ± 2.8 (4)

*some measured by M. Indrawan and C. Vaurie; includes specimens from Taliabu Island.

tarsi, toes and claws are paler than in AMNH 673966, and the fault bars on its rectrices line up; however, its age class must be considered uncertain. MZB 31.255 is probably a full adult, although it has brownish patches in the right scapulars and inner base of the left central rectrices and associated coverts (possibly induced by chemical means). It lacks the brownish wash over the cape of the two AMNH specimens, which might be due to slight foxing (M. LeCroy *in litt.* 2009), a type of light-induced post-mortem change from black to reddish-brown; however, a brownish-tinged cape is apparent in some living birds photographed by PV. MZB 31.256 is clearly a full adult, lacking any

TABLE 5

Summary results from Principal Components Analysis of Banggai Crow *Corvus unicolor* and Slender-billed Crow *C. enca*.

	Loadings	
Measurement	Factor 1	Factor 2
Nasal feather length	0.86	0.03
Culmen length from skull	0.93	-0.12
Culmen ridge width from distal nares	0.39	0.70
Bill height from distal nares	0.61	0.44
Bill width from distal nares	0.67	0.42
Wing length	0.92	-0.28
Tarsus length	0.93	0.01
Hindclaw length	0.89	-0.12
Tail length	0.78	-0.49
Variance explained (eigenvalue)	5.65	1.21
% total variance explained	62.82	13.43

brownish areas, and with unworn, rounded rectrices and outer remiges. Neither MZB *C. unicolor* specimen shows evidence of typical juvenile *Corvus* characters such as fluffier-textured feathers on the nape, mantle and / or vent; brownish overall colour; or distinctly paler areas on the bill or tarsi.

The conspicuous, broad bare fleshy eye-ring of the two MZB specimens was dark greyish in life, and is blackish in the specimens. The bill, both in life and in the specimens, is completely black (Color 82, Blackish Neutral Gray; Smithe 1975). The rictal bristles are stiff and cover the base of the culmen and part of the nares. The feet are dark Blackish Neutral Gray, with a metallic sheen, both in life and in the specimens.

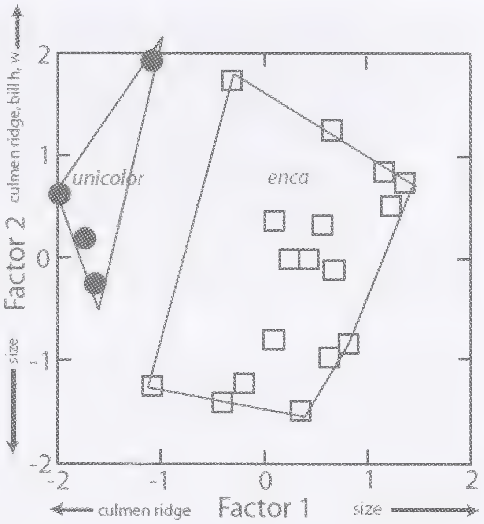

Figure 2. Plot of Banggai Crow *Corvus unicolor* and Slender-billed Crow *C. enca* specimen factor scores on Factors 1 and 2 from Principal Components Analysis. Factor 1 is a strong size axis, on which only culmen ridge width is negatively correlated, and Factor 2 is a shape axis, contrasting bill dimensions other than length with overall size.

***Comparisons with Corvus enca celebensis and C. e. mangoli*.**—Compared to *C. unicolor*, *C. enca celebensis* is distinctly larger and especially longer winged (Table 4, Fig. 2). The bill of *C. e. celebensis* is somewhat variable in length but is not as markedly different in size and shape from that of *C. unicolor* as are some specimens of *C. e. mangoli*, as both the former have proportionately short, heavy bills. While *C. e. celebensis* and *C. e. mangoli* have long, bushy narial bristles and relatively well-developed throat hackles, the bristles are reduced (see Table 4) and the hackles are not evident in *C. unicolor*. In colour, *C. unicolor* specimens are much less purple-glossed above than on *C. e. celebensis*. The little gloss that *C. unicolor* has above is bluer than in *C. e. celebensis*. Differences in the shade of black on the underparts between *C. e. celebensis* and *C. unicolor* are not constant. The feather bases of *C. e. celebensis* are brilliant white over the entire body, while those of *C. unicolor* are strongly grey.

Compared to *C. unicolor*, *C. e. mangoli* is noticeably larger and the bill is relatively more slender and much longer (Table 4), although bill length is quite variable if birds from Taliabu are included. The plumage colour was strikingly different; compared to *C. unicolor*, *C. e. mangoli* has a paler, slatier tone vs. darker and blacker in *C. unicolor*. As in *C. e. celebensis* but very unlike *C. unicolor*, the bases of the blackish feathers in *C. e. mangoli* were white.

Compared to specimens of *C. e. celebensis* and *C. e. mangoli*, as well as the two smallest races of *C. enca*, *C. e. pusillus* and *C. e. samarensis*, it is clear that *C. unicolor* differs proportionally from these disparate taxa (Fig. 2, Table 5). It is smaller overall than any of the other taxa, with a relatively heavy, short bill.

***Field identification*.**—Although specimens of *C. unicolor* do resemble small *C. enca*, and hence it might seem that field identification of these all-black birds would be difficult, this is not the case (see Fig. 3). The pale grey irides of *C. unicolor* had not previously been suspected, as the syntypes bear no information on soft-part colours. In photographs of live birds, Banggai Crows also appear very large-eyed, which in combination with the pale irides should aid field identification; while juvenile Slender-billed Crows may show a grey iris, this presumably is still distinctly darker than the iris of *C. unicolor*, although further substantiation is needed. Photographs in life also show that the Banggai Crow's massive (hardly 'insignificant', *contra* Madge & Burn 1994) but relatively short bill is an obvious identification feature, especially given the birds' small overall size. However, to appreciate these characters close views are necessary, and the species' nervous behaviour may make prolonged observation at close quarters difficult.

The very short wing and tail of Banggai Crow are also noticeable in the field and give the species a very different appearance in flight compared to *C. enca*. *C. unicolor* has a very distinctive fast fluttering flight which differs from the typically much slower wingbeats of *C. enca*.

Banggai Crow and Slender-billed Crow appear to have different habitat preferences. While *C. enca* seems to be largely restricted to open areas in coastal lowlands up to 300 m, Banggai Crow is found at higher elevations and in less-disturbed forest.

C. unicolor is a very vocal species and is often heard before being seen. While *C. enca* on Peleng typically utters a series of cawing notes (Fig. 4), the call of *C. unicolor* is much more reminiscent of the shrill screeches of *C. typicus*, being usually repeated 3–4 times, and sometimes followed by a loud whistle (Fig. 4). Therefore, when crows are heard on Peleng, field identification is straightforward.

Discussion

With these unequivocal specimens, photographs and recordings from Peleng Island, there can be no more doubt about the current survival and identity of the Banggai Crow.

Regarding the questionable nature of the locality data of the syntypes of *C. unicolor*, in the first place, the Banggai Islands are not now generally considered part of the Sula Islands. However, at least 24 of the specimens in the AMNH from the Banggai Islands are labeled as if the latter are a group within the Sula Islands, making it clear that this treatment is simply an historical artefact and should not be seen as casting doubt upon the provenance of the syntypes within the Banggai Islands. On the other hand, L. D. W. A. van Renesse van Duivenbode, a planter and merchant based on Ternate (near Halmahera) whose specimens are from various islands through Ternate in 1860–81, is not known to have personally collected in the Banggai Islands, and (as alluded to by Hartert 1919), his collection has been considered to contain unreliable records (see also White & Bruce 1986). Although Hartert (1919) stated that the locality in this case must have been correct, as shown by other species and subspecies, he did not indicate which other taxa these were and we have not been able to verify this based on listings of AMNH holdings. While Meinertzhagen (1926) identified the *C. unicolor* syntypes as probable trade skins, he provided no rationale for this and appears to have groundlessly equated the fact that these are native-prepared skins with their being trade skins. Some authors have indicated the Banggai Islands (the group as opposed to the island) as the provenance (Blake & Vaurie 1962, Goodwin 1976), but curiously none of the above suggested Peleng, the largest of the Banggai Islands, as the home of this species.

Other attempts to elucidate the circumstances of collection of *C. unicolor* have been inconclusive. Bruce (1986) stated that one of Rothschild's collectors, H. Kühn, worked in the Banggai Islands in 1884–85, and Coates & Bishop (1997) concluded, perhaps on this basis, that the species was known from 'two specimens from an unspecified island in the Banggai archipelago, collected during 1884–1885.' However, the AMNH collection (which now holds almost all of Rothschild's bird skins) appears to possess no Kühn specimens from the Banggai Islands. Collecting in the Banggai islands, including Peleng, was undertaken in *c.*1892 and in May–August 1895 by C. W. Cursham (Eck 1976, White & Bruce 1986), with *c.*400 of Cursham's specimens from the Banggai Islands held in Dresden at the Staatlichen Museums für Tierkunde (SMTD) (Eck 1976: 88); 84 Cursham specimens from Banggai Island and 72 from Peleng Island are at AMNH; and still others are in Berlin at the Museum für

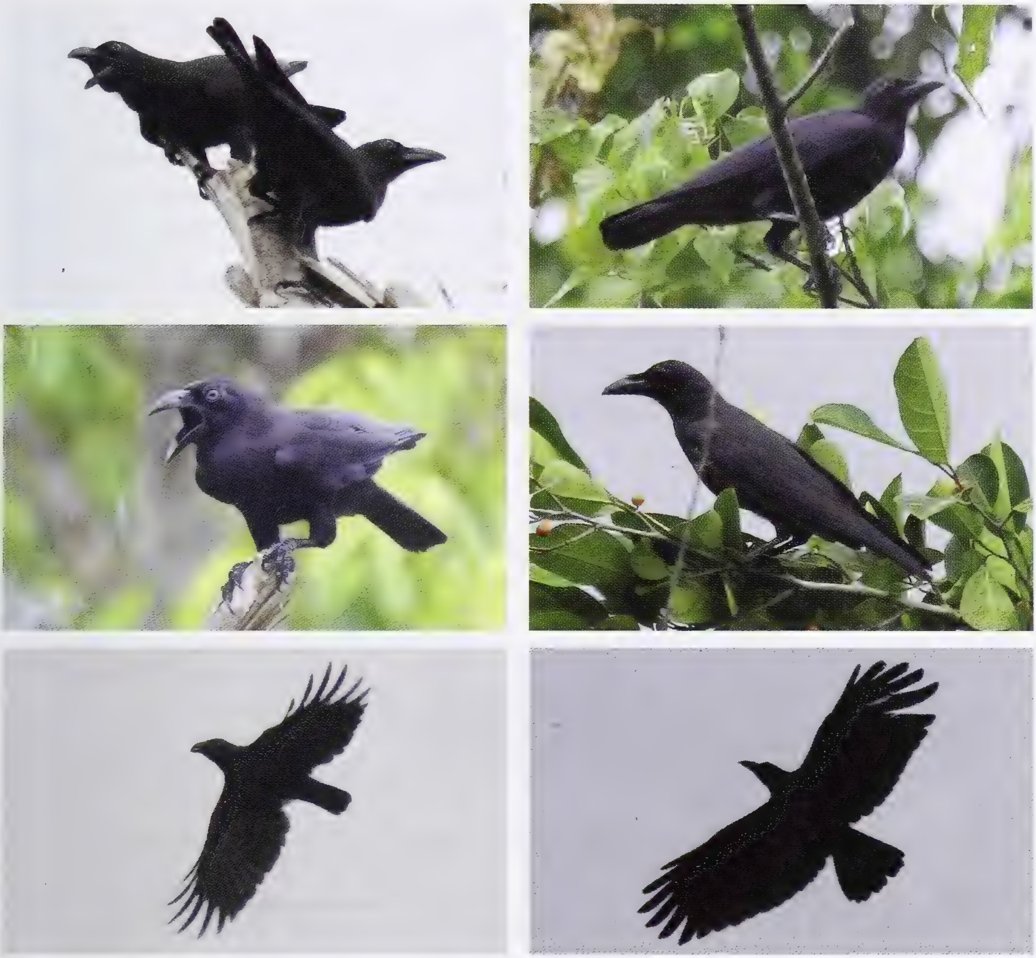

Figure 3. Photographs of living Banggai Crows *Corvus unicolor* (left column) and Slender-billed Crows *C. enca* (right) from Peleng Island. All Banggai Crow photographs were taken in the hill forests of western Peleng (650–900 m) near Tataba town; upper left on 23 March 2009, middle left 4 April 2009, and bottom left 23 March 2009. All Slender-billed Crow photographs were taken in an agricultural area near Salakan town in eastern Peleng on 6 April 2009. All photographs by P. Verbelen.

Naturkunde. Thus, although Cursham was evidently the sole major collector in the Banggai Islands prior to the description of *C. unicolor*, it is unclear whether Duivenbode could have obtained the two syntypes from him, and it seems unlikely that Cursham would not have presented them directly to Rothschild rather than sending them to Duivenbode. Following the description of *C. unicolor*, a few specimens were collected in the Banggai Islands by W. Kaudern in 1920 and a Mr Van Den Bergh in 1932 (Bishop 1992). Finally, in July–August 1938, J. J. Menden collected birds on Peleng (Eck & Quaisser 2004). None of these collectors obtained any further crows in the Banggai Islands.

All this uncertainty has naturally given rise to the question of whether the syntypes of *C. unicolor* were actually collected in the Banggai Islands. Although the type locality of Banggai Crow will probably never be known with certainty, the rediscovery of Banggai Crow on Peleng Island confirms that this distinctive taxon does occur in the Banggai Islands, although perhaps not on Banggai Island itself. Of course, one possibility is that the syntypes did come from Banggai Island and that the species is now extirpated there. It

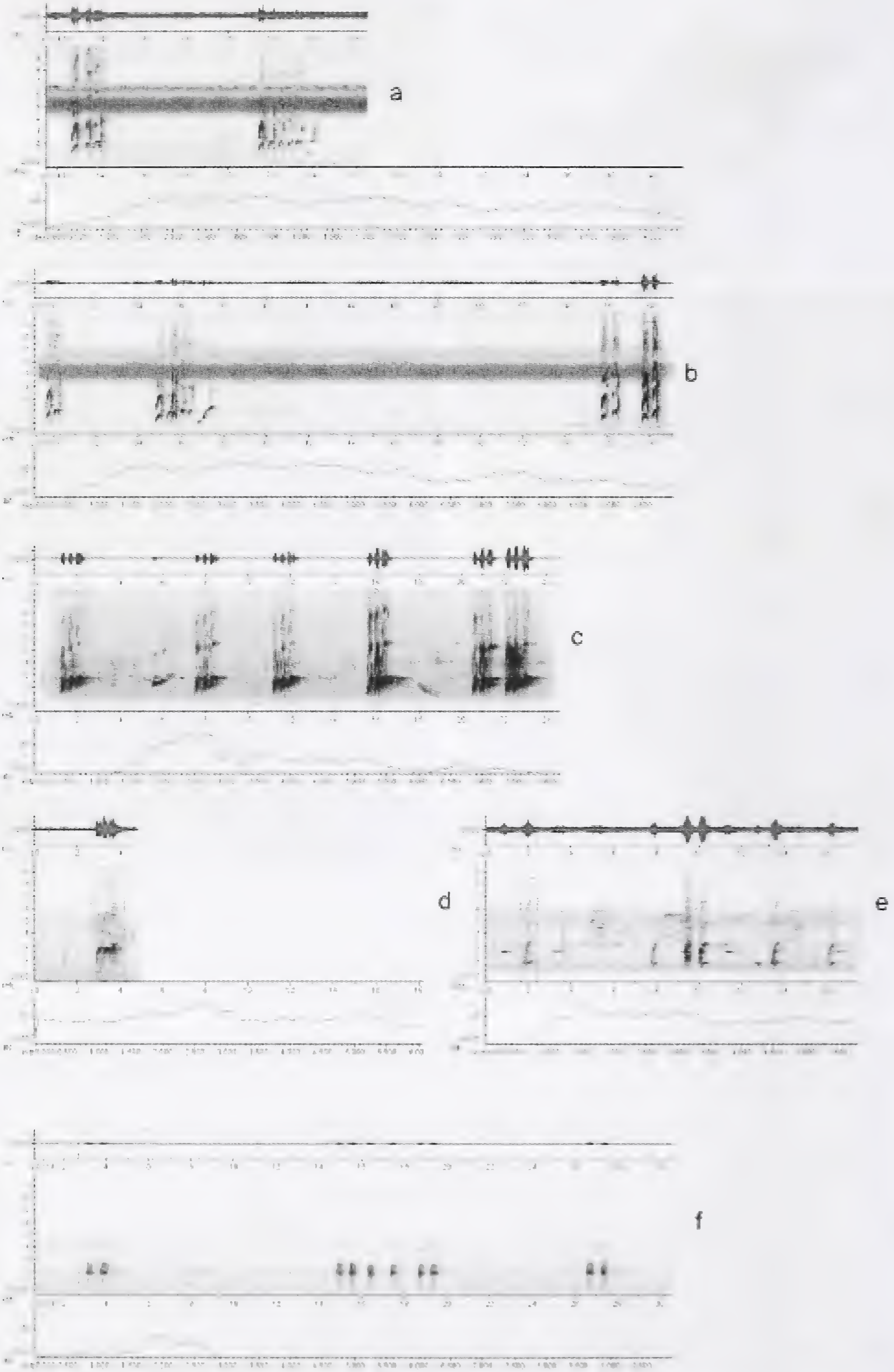

Figure 4. Sonograms of vocalisations of Banggai Crow *Corvus unicolor* (a, b), Piping Crow *C. typicus* (c–e) and Slender-billed Crow *C. enca* (f) on Peleng. All recordings made by F. Verbelen, other than c by D. Farrow (XC 19806), d, e by P. Noakes (XC 22446, 22447).

seems more likely that the type specimens came from Peleng Island, but further study of habitat and altitudinal requirements may provide evidence on the matter. There is no evidence that it occurs in the Sula Islands, so the original type locality was almost certainly due to prevailing usage and / or informal grouping of these two geographically close island groups.

Hartert (1919) did not distinguish between the two syntypes, but AMNH 673967 was clearly his intended type, as he affixed to it a Rothschild type label which now reads '{Syn}type of *Gazzola unicolor* R & H, (Banggai,) Sula Islands (Nat. Coll.)'. That specimen was therefore catalogued as the type when the Rothschild Collection came to AMNH, and was segregated with the type specimens, while the second syntype was only later added to the AMNH type collection (M. LeCroy *in litt*. 2009). The label of AMNH 673966, written by M. LeCroy, bears the data 'Syntype of *Gazzola unicolor* Rothschild and Hartert 1900, BBOC 11:29'. We hereby designate AMNH 673967 the lectotype of *Gazzola unicolor* in order to remove the ambiguity inherent in the original description. AMNH 673966 becomes the paralectotype.

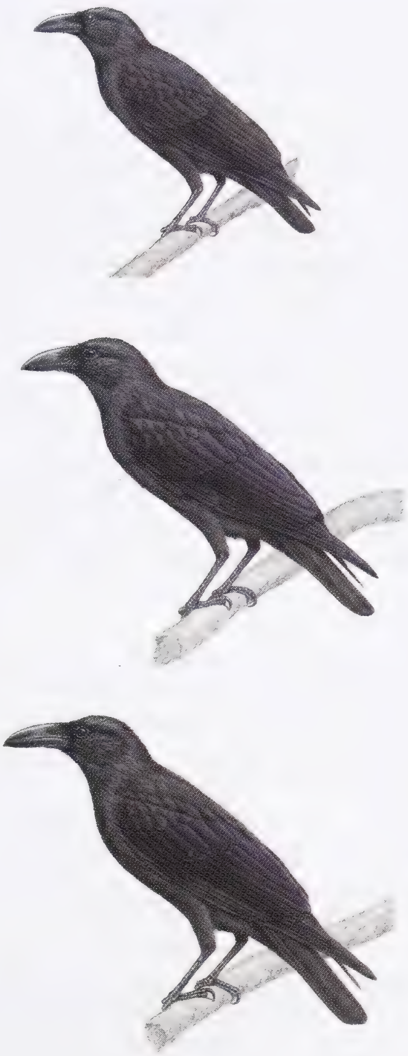

Figure 5. Banggai Crow *Corvus unicolor* (top) in comparison with two subspecies of Slender-billed Crow, *C. enca celebensis* (centre) and *C. e. mangoli* (bottom). Painting by Agus Prijono.

The species-level taxonomy of the Banggai Crow has long required clarification. In the original description of *C. unicolor*, Rothschild & Hartert (1900) characterise the species as '[l]ike *Gazzola typica* from Celebes in structure, size, and form, but differing in its uniform blackish colour, and the bases of the black feathers not being white, but grey. The upperside has a fine purplish-blue gloss, strongest on the wings and crown, while the hind-neck, chest, breast, and abdomen . . . are duller and more brownish slaty black. Wing 203 to 207 mm., tail 112 to 117, Culmen 47, metatarsus 40.' At that time, *C. enca* was unknown from the Banggai Islands, and Rothschild & Hartert (1900) did not explicitly compare *Gazzola* with *C. enca*. Meinertzhagen (1926) and Stresemann (1940) continued to treat *C. unicolor* as a species but both suggested it might be a race of *C. enca*. Dorst (1947), in contrast, treated *C. unicolor* as a race of *C. typicus*, but this was not widely followed. Instead, Vaurie's (1958) decision to treat *C. unicolor* as a subspecies of *C. enca* has been far more influential, although he did not mention the fact that *C. unicolor* differs strikingly from geographically proximate races of *C. enca* in having strongly grey, rather than bright white, bases to the feathers over the entire body. Eck (1975, 1976) followed Vaurie in treating *C. unicolor* as a race of *C. enca*, but he questioned this assignment and stated that *C. unicolor* is the only strongly marked Banggai endemic bird taxon. More recently, *C. unicolor* has been said to differ from geographically adjacent races of Slender-billed Crow *C. enca* (*C. e. celebensis* of Sulawesi and some satellites, and *C. e. mangoli* of the Sula Islands) on the basis of its smaller size, comparatively 'insignificant' bill, more highly glossed plumage, and grey (vs. white) bases to neck feathers (Madge & Burn 1994). It has generally been afforded species status on the basis that it may be more closely related to *C. typicus* than to *C. enca* (Goodwin 1976, Madge & Burn 1994, Inskipp *et al.* 1996), and Sibley & Ahlquist (1990) treated the taxon as *C.* (*typicus*) *unicolor*. Madge & Burn (1994) also suggested that *C. unicolor* 'is very close to the Piping Crow and it could in fact be an isolated, wholly blackish form of this species'.

The new Banggai Crow specimens confirm the known characteristics of the species that were previously based solely on the two syntypes, in that all four have consistently short wings and tails, all are basically all black with strongly grey feather bases (very unlike the bright white feather bases of most races, including all the geographically proximate ones, of *C. enca*), and all four have deep, short bills. The revelation that the iris of Banggai Crow is pale strongly supports its specific distinctness, as adults of Slender-billed Crow have dark irides. Except for the wing measurement of the hunter-killed specimen that was not preserved, the other Banggai Crow specimens are very similar in shape and size, and show no approach to Slender-billed Crow (at least to *C. e. celebensis* and *C. e. mangoli*). On the other hand, *C. unicolor* and *C. typicus* are very similar in measurements (see Appendix). Past treatment of *C. unicolor* as conspecific with *C. enca* was based on the fact that some small taxa treated as races of *C. enca* (*C. e. pusillus* and especially *C. e. samarensis*) do occur in the Philippines, but these differ in several respects from *C. unicolor* and, given their geographical ranges, they are highly unlikely to have any close relationship to *C. unicolor*.

Compared with the taxon of *C. enca* that now inhabits Peleng Island (the subspecific identity of which is unresolved), Banggai Crow has different vocalisations, behaviour and ecology (e.g. preference for more closed canopies, whistled main call rather than simple cawing, and swifter flight; Indrawan *et al.* 2010). The behaviour, vocalisations and ecology of *C. unicolor* seem more similar to *C. typicus* of mainland Sulawesi, but the ranges of these two taxa are separated by a deep strait (>900 m), although at the narrowest point Sulawesi and Peleng are separated by only 14 km, and the landmasses either side had different tectonic origins (Banggai being part of the Sula spur; Hall 1998, 2001). In addition, although their vocalisations are remarkably similar (both being very different from *C. enca*), those of *C. unicolor* have stronger harmonics, which is reflected in its less pure and lower pitched sounding vocalisations than those of *C. typicus* (Fig. 4). Further study with a larger sample of homologous vocalisations of both taxa is required to establish whether they are consistently different, and controlled playback experiments could shed light on species recognition. Considering the obvious differences in morphology between *C. unicolor* (which is all black) and *C. typicus* (which is pied); apparent minor differences in vocalisations; and in comparison with accepted species limits in other *Corvus* species, we advocate treatment of *C. unicolor* as specifically distinct under the Biological Species Concept. We believe it highly likely that *C. unicolor* and *C. typicus* are sister species.

Further questions remain concerning the subspecific identity of the local congener of *C. unicolor* on Peleng Island. Although field observations indicate that *C. e. celebensis* (rather than the equally likely *C. e. mangoli*) is the local form on the Banggai Islands, specimen evidence is still needed. Judicious collection of voucher material of Slender-billed Crow in the Banggai Islands is possible because the bird is common. Anecdotal information suggests that *C. enca* may be a competitor for the Critically Endangered *C. unicolor* (BirdLife International 2001, 2005, 2007), especially where moist forests have been converted to plantations. Whether *C. enca* poses a threat to *C. unicolor* via hybridisation at ecotones is unknown and requires study.

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APPENDIX

Measurements of adult males[a] of the Slender-billed Crow *Corvus enca* species group (after Vaurie 1958).

Form	N	Wing length	Tail length	Bill length (measured from skull)	Bill length (measured from nostril)	Bill height[b]
C. e. compilator	5	316–343 (322)	160–70 (165)	65–69 (66.4)	46–49 (47)	14.0–15.5 (15)
C. e. enca	6	282–293 (287)	139–151 (143.5)	55–60 (58)	36–42 (39.5)	12.5–13.5 (13)
C. e. celebensis	10[c]	255–298 (277)	127–147 (136)	53–58 (55)	35–40 (38)	12–15 (13.7)
C. e. unicolor[d]	2	210, 213	105, 111	46, 46	31, 32	12, 12
C. e. mangoli	2	260, 275[e]	133, 134[e]	59, 63[e]	41, 43[e]	13, 14[e]
C. e. violaceous	3	236, 253 (245)	131–136 (134)	50–53 (51.3)	36–38 (36.7)	12.0–13.5 (13)
C. e. pusilus	2	255, 263	134, 136	51, 53	35, 38	13, 14
C. e. samarensis	3[f]	215–225 (220.7)	102–113 (108)	50–53 (51)	35–37 (35.7)	all 13
C. typicus	6	203–214 (210)	108–117 (112)	45–47 (46)	32–34 (33)	11–13 (12.4)
C. florensis	1[g]	226	164	48	31	12
C. kubaryi	6	225–242 (234,6)	150–162 (156.5)	53–57 (55.6)	38–42 (40)	11–14 (12.6)

[a] Except for adult females or adult unsexed specimens mentioned in the footnotes

[b] Upper half of the bill measured at the level of the nostril

[c] The type of *C. e. celebensis*, an adult male, has the following measurements: wing, 280; tail, 135; bill from skull, 53; bill from the nostril, 36; height of bill, 15

[d] Type of *C. unicolor*; both specimens are unsexed adults

[e] Type of *C. e. mangoli*, adult male; the other specimen is an adult female

[f] One male, one female, one unsexed, all adults

[g] This taxon is known also from only two specimens, the one measured being an adult female

New biogeographic records in the avifauna of Peleng Island (Sulawesi, Indonesia), with taxonomic notes on some endemic taxa

by Frank E. Rheindt, Filip Verbelen, Dadang Dwi Putra, Abdul Rahman & Mochamad Indrawan

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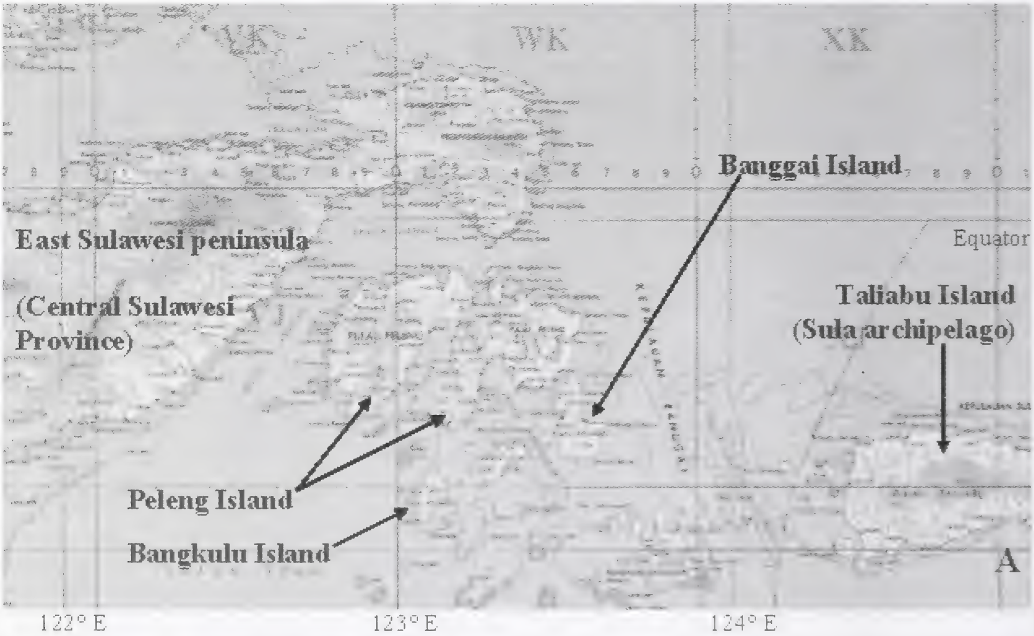
Summary.—The island of Peleng is the largest of the Banggai archipelago. It is 14 km south-east of eastern Sulawesi and 80 km west of the Sula Islands. However, despite Peleng's low degree of isolation, its bird community is characterised by unusually high endemism, with a surprisingly pronounced Sula avifaunal element. Little is known about the birds of Peleng, as the island has been largely neglected by collectors and field ornithologists alike. We present new data on the birds of Peleng, partially based on an intensive recent survey of the highland avifauna in the west of the island, but also on long-term research and conservation work at lower elevations. We report new elevational data for 23 species, as well as 16 species new for the island. Most of the new island records fill artefactual gaps in the distribution of species known to occur on Sulawesi to the west and on the Sula Islands to the east. Four new island records are genuine eastward range extensions of Sulawesi taxa or westward extensions of Sula species. We provide details on the discovery, morphology and vocalisations of up to five apparently undescribed taxa, with one or two probably new species to science, although their scientific description awaits the collection of specimens. Lastly, we comment on the taxonomy of several Banggai birds that require urgent systematic revision using genetic or vocal data.

The Banggai archipelago lies off the eastern peninsula of Sulawesi (Fig. 1). It covers almost 3,000 km^2 and numbers four main islands, with Peleng (2,406 km^2) the largest (Fig. 1). Peleng is immediately adjacent to the Sulawesi mainland, and the narrow Peleng Strait separating the two islands is just 14 km wide at its narrowest point. The island is divided into a large western, small central and intermediate eastern landmass, the central one being connected to the others by narrow isthmuses. Whilst the central and eastern parts are low-lying and barely exceed 500 m, the west rises to 969 m in its interior, with *c.*40% of its land above 700 m (Fig. 1). Despite Peleng's geographical predominance, the archipelago takes its name from the second-largest island, Banggai (Fig. 1), formerly the cultural hub of the region. To the east, a string of smaller islands almost connects the Banggai archipelago with Taliabu, the largest island of the Sula group (Fig. 1). The nearest distance from Banggai to Taliabu slightly exceeds 80 km.

Despite its immediate vicinity to Sulawesi, the avifauna of the Banggai Islands exhibits many differences to that of its larger neighbour (see, e.g., White & Bruce 1986). The number of range-restricted and near-endemic bird species on the Banggai Islands is unusual compared to other Sulawesi satellite islands of a similar size and distance from the mainland, such as Muna or Butung, which display almost no avian endemism. The Banggai archipelago shares much of its endemism with the Sula Islands to the east (ICBP 1992, Sujatnika *et al.* 1996, Stattersfield *et al.* 1998, Indrawan 2004), despite the distance to the Sula Islands being more than five times greater than to Sulawesi (Fig. 1). Consequently, the Banggai and Sula

Islands have been accorded status as an Endemic Bird Area (ICBP 1992, Sujatnika *et al.* 1996, Stattersfield *et al.* 1998). In their initial assessment using the distributional and taxonomic knowledge of the day, ICBP (1992) listed nine range-restricted bird species shared by the two archipelagos.

Whilst the faunal connection between Banggai and Sula has long puzzled zoologists, modern geological, palaeoclimatic and bathymetric data largely explain these biogeographic ties. Despite the vicinity to the Sulawesi mainland, the geological history of the Banggai archipelago is tied to that of the Sula Islands (Hall 2002). The two groups are composed of metamorphic and igneous continental rocks of Australian–New Guinea affinities, surrounded by shallow and deep marine Palaeozoic and Mesozoic sediments (Hall 2002). Together, they have been drifting west towards Sulawesi, closely approaching it within the last four million years (Hall 2002). Apart from their shared geological origin, the Sula and Banggai islands have also repeatedly been connected during *c.*20 glacial epochs within the last three million years that each lasted *c.*10,000–50,000 years. These connections arose when glacial periods caused global sea levels to fall by up to 130 m (Voris 2000, Lambeck & Chappell 2001, Siddall *et al.* 2003, Bintanja *et al.* 2005, Thompson & Goldstein 2005, Caputo


Banggai Island
East Sulawesi peninsula
(Central Sulawesi Province)
Equator
Taliabu Island (Sula archipelago)
Peleng Island
Bangkulu Island
A
122° E
123° E
124° E

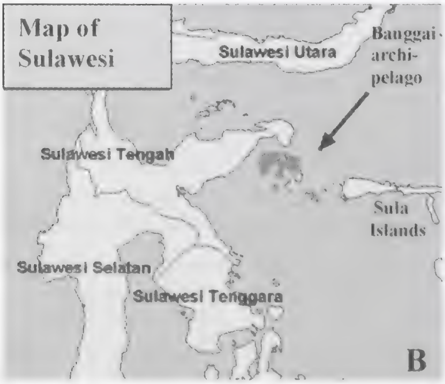

Map of Sulawesi
Sulawesi Utara
Banggai archi-pelago
Sulawesi Tengah
Sula Islands
Sulawesi Selatan
Sulawesi Tenggara
B

Figure 1. (A) Location of Peleng Island in the Banggai archipelago adjacent to the Sulawesi mainland. Note that the second-largest island in the Banggai archipelago also bears the name Banggai. Peleng, Banggai, Bangkulu and several minor islands comprise the Banggai archipelago. (B) Location of the Banggai archipelago between the Sulawesi mainland and the Sula archipelago. Old provincial names on Sulawesi are in Indonesian: Sulawesi Utara = North Sulawesi, Sulawesi Tengah = Central Sulawesi, Sulawesi Tenggara = South-east Sulawesi, Sulawesi Selatan = South Sulawesi.

2007) exposing areas of shallow sea, such as along the string of islands that connect the Sula and Banggai archipelagos. Despite their narrow extension, the Peleng Strait between Sulawesi and Peleng—in contrast—never accommodated a landbridge, being characterised by a deep-sea trench *c.*400–700 m deep (Becker *et al.* 2009).

Its high level of endemism and easy accessibility notwithstanding, the Banggai group is one of the least-explored avifaunal hotspots in Indonesia. Whilst the Sula Islands have been targeted by recent avifaunal work (Davidson *et al.* 1991, Stones *et al.* 1997, Rheindt 2010; B. King *in litt.* 2006; FV unpubl.), the Banggai archipelago has been less visited. MI has undertaken periodic zoological research and long-term conservation work in the islands for 18 years (e.g. Indrawan *et al.* 1993, 2009). Since 2004, the Celebes Bird Club (2006, 2007, 2008) has joined MI's group, with a more recent focus on the largely unknown montane areas of Peleng.

Peleng has undergone dramatic forest conversion in the past decades. The low-lying east and centre of the island may no longer harbour significant primary forest, and all we have seen here are patches of degraded secondary forest and smaller remnants of older secondary forest (MI, FER & FV pers. obs.). The western lowlands are also largely deforested, but habitat quality improves higher, with substantial patches of secondary forest above 600 m grading into primary forest at *c.*800 m (MI, DER & FV pers. obs.). Older villagers confirm that tall forest reached well into the lowlands 30–40 years ago.

This paper addresses our limited knowledge of the avifauna of the Banggai Islands. Based on our long-term research and conservation work there (MI) and a recent intensive avian inventory of the unexplored highlands of Peleng (FER, FV, DDP, AR, MI), we present data on 16 new bird species for the Banggai archipelago, including preliminary documentation of 1–5 undescribed subspecies and / or species. We also present data on 23 elevational range extensions or new elevational data from the Banggai Islands. In addition, we provide data that resolves or questions the taxonomic status of several endemic taxa that require phylogeographic attention.

Study area and Methods

Over the past 18 and five years, respectively, MI and the Celebes Bird Club have periodically conducted ornithological research at study sites throughout the Banggai Islands. Details of some of these were presented by Indrawan *et al.* (1991). The montane west of Peleng, around Tataba, was visited on 2–7 October 2004 (MI & I. Tinulele), 12 September–11 October 2006 (MI, Y. Masala, A. Maleso & F. Masala), 27 April–17 May 2007 (MI, Y. Masala, A. Maleso, F. Masala & D. S. Katiandagho), 18 January–9 February 2008 (same observers as previous) and 23 March–13 April 2009 (DDP & AR; Celebes Bird Club). FER & FV visited the same area on 22–31 March 2009—and FV alone on 2–5 April 2009—and observed birds over a broad spectrum of habitats and elevations, from coastal coconut plantations to montane primary forest above 900 m. Subsequently, FV visited the lowlands of Peleng around the capital of Salakan on 5–8 April 2009 and searched for birds in degraded secondary lowland forest from sea level to *c.*100 m. Almost two weeks later, FER visited the same site on 20–21 April 2009. Since 1991, the eastern lowlands including Salakan were also subject to archipelago-wide multiple surveys by Indrawan *et al.* (1993, 1997). The south-east part of western Peleng was explored to *c.*900 m on 1–7 May 2007 (MI & D. S. Katiandagho unpubl.).

FV took bird photographs using a Canon Eos 40D digital camera and 100–400 mm lens, while FER used a Panasonic Lumix DMC-FZ18. Sound-recordings were made using an Edirol R-09 HR and a ME-66 Sennheiser directional microphone (FV) or a Sony TCM-200DV cassette recorder with inbuilt microphone (FER). Sonograms were prepared using Syrinx version 2.6h by John Burt (available at www.syrinxpc.com). Sound-recordings will be uploaded to the xeno-canto online sound library (www.xeno-canto.org/asia) provided their quality is sufficient. In some cases, we have supplemented our data with our unpublished bio-acoustic material from elsewhere.

Species accounts

The following details some of the species recorded on Peleng during our field work, being new island records, new elevational records or noteworthy from a distributional or taxonomic perspective. Order and nomenclature principally follow White & Bruce (1986) and Coates & Bishop (1997) Species recorded by us but not included in these accounts are listed in Table 1.

TABLE 1

Species encountered during field work in Peleng but not included in the in the main text.

Species name	**Comments**
Purple Heron *Ardea purpurea*	1 near sea level
Little Egret *Egretta garzetta*	1 near sea level
Pacific Reef Egret *E. s. sacra*	1 near sea level
Little Heron *Butorides striata javanica*	2 near sea level
Brahminy Kite *Haliastur indus intermedius*	-
Barred Honey Buzzard *Pernis c. celebensis*	1 at *c.*750 m
Sulawesi Serpent Eagle *Spilornis rufipectus sulaensis*	1 at *c.*700 m, 1 near sea level
Black Eagle *Ictinaetus m. malayensis*	1 at *c.*350 m
Vinous-breasted Sparrowhawk *Accipiter rhodogaster sulaensis*	2 adults at a nest at *c.*550 m
Spotted Kestrel *Falco moluccensis microbalius*	near sea level
Sula Scrubfowl *Megapodius bernsteinii*	several seen and sound-recorded at *c.*100 m in degraded forest near Salakan (eastern Peleng)
Red-backed Buttonquail *Turnix maculosus kinneari*	1 heard in agricultural land at *c.*100 m near Salakan (eastern Peleng)
Slaty-legged Crake *Rallina eurizonoides minahasa*	sound-recorded at *c.*650 m
Barred Rail *Gallirallus torquatus sulcirostris*	several family groups heard and seen near sea level in eastern Peleng
White-breasted Waterhen *Amaurornis phoenicurus leucomelana*	common at sea level in eastern Peleng
Common Sandpiper *Actitis hypoleucos*	1 on a beach near Salakan (eastern Peleng)
Sulawesi Black Pigeon *Turacoena manadensis*	Several near sea level; 1 seen and <4 heard at *c.*750–900+ m
Brown Cuckoo Dove *Macropygia amboinensis albicapilla*	common from sea level to at least 800 m
Emerald Dove *Chalcophaps i. indica*	-
Black-naped Fruit Dove *Ptilinopus melanospilus chrysorrhous*	common from sea level to 850 m
Grey-cheeked Green Pigeon *Treron g. griseicauda*	near sea level
Ornate Lorikeet *Trichoglossus ornatus*	near sea level
Blue-backed Parrot *Tanygnathus s. sumatranus*	near sea level
Rusty-breasted Cuckoo *Cacomantis sepulcralis virescens*	common from sea level to at least 800 m
Black-billed Koel *Eudynamys melanorhynchus*	common from sea level to over 900 m
Lesser Coucal *Centropus bengalensis javanensis*	common from sea level to over 900 m
Great Eared Nightjar *Eurostopodus macrotis macropterus*	occasional to common to over 900 m
Grey-rumped Treeswift *Hemiprocne longipennis wallacii*	-

Glossy Swiftlet *Collocalia e. esculenta*	common from sea level to over 900 m
Great-billed Kingfisher *Halcyon melanorhyncha dichrorhyncha*	several along the coast; 1 photographed on a beach in eastern Peleng had an extensive red base to the lower mandible (not shown)—see Indrawan *et al.* (1997) for comment on variability
Pacific Swallow *Hirundo tahitica javanica*	near sea level
Golden-headed Cisticola *Cisticola exilis rusticus*	1 in agricultural land at *c.*100 m
Flyeater *Gerygone sulphurea flaveola*	common in degraded habitat from sea level to 550 m
Grey-streaked Flycatcher *Muscicapa griseisticta*	still common on 22–31 March 2009, but absent on 3–8 April and 20–21 April 2009
Island Monarch *Monarcha c. cinerascens*	common near sea level
White-breasted Woodswallow *Artamus leucorynchus albiventer*	near sea level to at least 700 m
Ivory-backed Woodswallow *A. monachus*	near sea level
Grosbeak Starling *Scissirostrum dubium*	common near sea level
Moluccan Starling *Aplonis mysolensis sulaensis*	common near sea level
Brown-throated Sunbird *Anthreptes malacensis extremus*	common near sea level
Olive-backed Sunbird *Nectarinia jugularis robustirostris*	common near sea level
Black-faced Munia *Lonchura molucca*	common near sea level

MALAYAN NIGHT HERON *Gorsachius melanolophus kutteri*

An immature was flushed from a trail in primary forest in western Peleng at *c.*850 m (FV, FER; 28 March 2009). The bird landed a few metres away and was observed for *c.*20 seconds. Subsequently, it flew to a nearby tree, where it was observed for two minutes and was photographed (Fig. 2). Confusion with the similar Japanese Night Heron *G. goisagi* can be eliminated by the presence of white markings on the black crown. *Gorsachius* night herons are usually cryptic and shy, and are rarely observed. In Wallacea, *G. melanolophus* is known only from the Talaud Islands and from a single previous record on Peleng, assumed to be a straggler (Coates & Bishop 1997). This second record on Peleng at the end of the northern winter suggests that it may be a regular winter visitor, passage migrant or even resident.

RUFOUS-BELLIED EAGLE *Hieraaetus kienerii formosus*

An adult was observed over degraded scrub and woodland at *c.*300 m in western Peleng (FV; 4 April 2009). The presence of a black 'helmet' contrasting with the white throat and rufous belly confirmed the identification. This is the first record for the Banggai Islands, although Indrawan *et al.* (1997) mentioned a probable sighting on 31 August 1996. The species occurs on Sulawesi and the Sula Islands, so the Peleng record closes this gap. Despite the paucity of historical records on Sulawesi, there have been many records in the last 30 years (Davidson *et al.* 1991). The discrepancy between historical and modern records suggests that *H. kienerii* might be expanding in range and / or abundance, perhaps due to habitat alteration. The Peleng record may have to be interpreted within this context, or the recent increase in sightings may be an artefact of improved observer coverage.

SPOTTED DOVE *Streptopelia chinensis tigrina*

One was heard and then seen in degraded lowland scrub near Salakan (eastern Peleng) at *c.*100 m (FER; 21 April 2009). Identification was based on the distinctive white-spotted black hindneck collar. MI previously saw the species in open habitats on Peleng, but did not note locations and dates, as its occurrence is unsurprising. These are the first records for the island. Spotted Dove is widespread in Asia and is thought to have been introduced to Wallacea. It is currently expanding its range in response to habitat modification (Coates & Bishop 1997). The species has previously been recorded from Labobo in the Banggai archipelago (Coates & Bishop 1997). These Peleng records confirm ongoing expansion through the islands.

GREEN IMPERIAL PIGEON *Ducula aenea sulana*
Heard and seen occasionally in primary forest from *c.*750 to over 900 m in montane western Peleng (FER, FV; 22–23 March 2009). Also encountered occasionally in degraded lowland forest near sea level in eastern Peleng on 5–8 April 2009 (FV), 20–21 April 2009 (FER) and on unspecified dates (MI). Represented on the Banggai Islands by the range-restricted subspecies *sulana*, which otherwise occurs only on the Sula Islands (White & Bruce 1986, Coates & Bishop 1997), previous elevational data for *D. a. sulana* have been limited to Taliabu, where recent work revealed its presence to *c.*1,000 m (Rheindt 2010). Our new Peleng records establish a similarly wide elevational range on the Banggai archipelago.

WHITE-BELLIED IMPERIAL PIGEON *Ducula forsteni*
An adult was observed in the canopy of secondary forest in montane western Peleng at *c.*700 m on 2 October 2004 (MI). On a separate but undated occasion, the species was heard above 500 m in the south-east of western Peleng (MI). Subsequently, on 23–30 March 2009, *D. forsteni* was heard occasionally and seen in flight on a daily basis in forest from *c.*750 m to over 900 m in the same region (FV, FER). Identification was based on the distinctly grey underparts and head, and the green back and breast-band of this bulky species. The calls confirmed the identification, strongly resembling the hollow deeply resonant vocalisations we have heard on Sulawesi and Taliabu. These are the first records on the Banggai Islands, and close a gap in the species' range between Sulawesi and Taliabu (White & Bruce 1986, Coates & Bishop 1997).

SUPERB FRUIT DOVE *Ptilinopus superbus*
Common in secondary and primary forest from 400 m to over 900 m in montane western Peleng (FV, FER; 23–31 March 2009), where it was sound-recorded. Additionally, MI, DDP & AR commonly heard the species in western highland Peleng above 500 m on several occasions, including on 18 January–9 February 2008 and 23 March–13 April 2009. These are the first records for the Banggai Islands. Identification of this easily recognised species was confirmed by sound-recordings (Fig. 3). Superb Fruit Dove occurs in Sulawesi (*P. s. temminckii*) and the northern Moluccas (*P. s. superbus*), but peculiarly appears absent from the Sula Islands (White & Bruce 1986, Coates & Bishop 1997). The population on Peleng probably has closest affinities with *P. s. temminckii.*

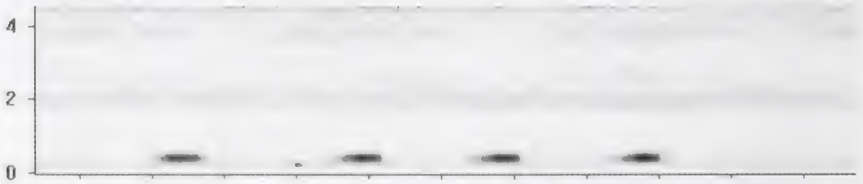
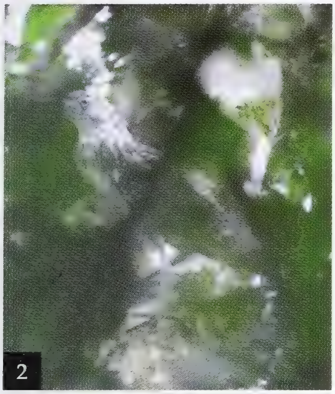
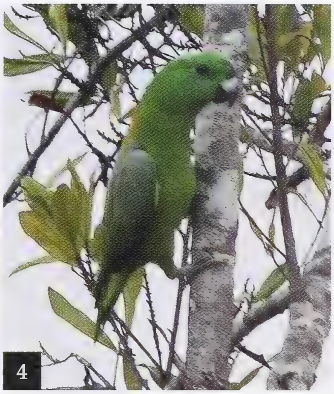


Figure 3. Recording of a hooting call series of Superb Fruit Dove *Ptilinopus superbus* at *c.*800 m on Peleng. X-axis = time (0.5 seconds per tick), y-axis = frequency (2 kHz per tick). Recording by F. Verbelen.





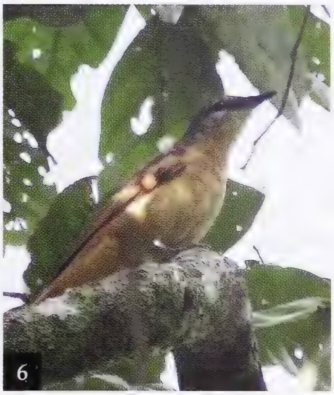
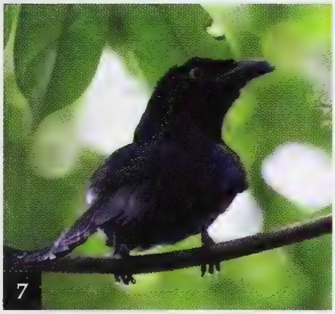
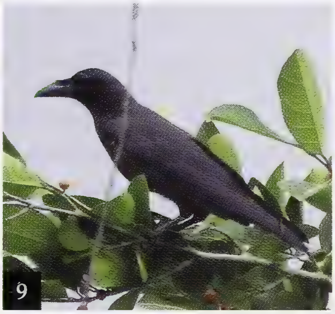


Figure 2. Malayan Night Heron *Gorsachius melanolophus kutteri*, western Peleng at *c.*850 m, 28 March 2009 (F. Verbelen)

Figure 4. Golden-mantled Racquet-tail *Prioniturus platurus*, Peleng at over 900 m, March 2009 (F. Verbelen). Note the conspicuous grey sheen to the shoulder that may be distinctive of the Peleng population.

Figure 6. Female Common Cicadabird *Coracina tenuirostris pelingi*, Peleng at *c.*700 m, March 2009 (F. Verbelen). Note the extensive cinnamon hue to the unstreaked underparts characteristic of this taxon.





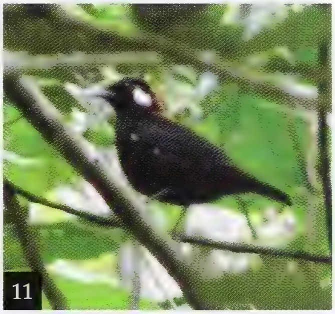
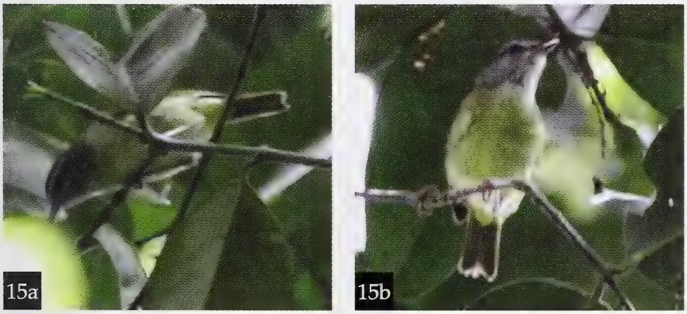


Figure 7. Hair-crested Drongo *Dicrurus hottentottus banggaiensis*, Peleng at *c.*600 m, March 2009 (F. Verbelen). Note the greyish irides.

Figure 9. Slender-billed Crow *Corvus enca*, Peleng near sea level, April 2009 (F. Verbelen). Note the long, heavy bill (*contra* the vernacular name).

Figure 11. Red-and-black Thrush *Zoothera mendeni*, lowland eastern Peleng, April 2009 (F. E. Rheindt). Note the all-black underparts. This may be the first photograph of a live bird.



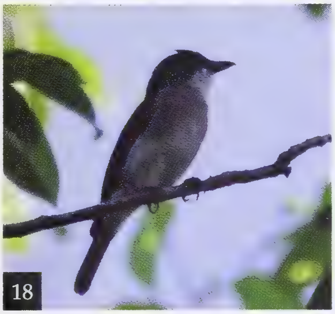


Figure 15. 'Peleng Leaf Warbler' *Phylloscopus* taxon novum, *c.*800 m on west Peleng, March 2009 (F. Verbelen). Note the yellowish tinge to the underparts slightly contrasting with the off-white throat and upper breast.

Fig. 18. Drab Whistler *Pachycephala griseonota*, Peleng at *c.*100 m (F. Verbelen). Note the strong contrast between the dark face and the white throat.

BANGGAI FRUIT DOVE *Ptilinopus subgularis*

Banggai Fruit Dove has long been considered conspecific with *P. s. epia* of Sulawesi and *P. s. mangoliensis* of Sula (e.g. White & Bruce 1986, Coates & Bishop 1997). However, a forthcoming analysis suggests that *subgularis* on the Banggai Islands merits biological species status, under the English name Banggai Fruit Dove (Rheindt & Verbelen in prep.). Two were observed foraging in the mid-canopy at a forest edge in montane western Peleng at *c*.800 m (MI; 3 October 2004). In the same region, MI also heard the species' distinct vocalisation on several undated occasions above 600 m, rarely lower. An active nest attended by an unsexed adult was found at *c*.800 m on 3 May 2007; it was a simple platform of small branches (MI). On 23–31 March 2009, the species was commonly heard in secondary to primary forest at *c*.500–900+ m in montane western Peleng (FER, FV), and was photographed once above 900 m (FV). Also photographed and sound-recorded in degraded forest in eastern Peleng near sea level on 5–8 April 2009 (FV) and 20–21 April 2009 (FER). These are the first published elevational data for the species.

GOLDEN-MANTLED RACQUET-TAIL *Prioniturus platurus*

Found in secondary and primary forest in montane western Peleng from *c*.650 m, becoming noticeably commoner at higher, undisturbed elevations (FV, FER; 23–31 March 2009). It was common around mountaintops above 900 m (FV, FER). On various visits to western Peleng, MI, DDP & AR also observed the species at 600–900 m on a near-daily basis. It was encountered occasionally in degraded forest in eastern Peleng near sea level on 5–8 April 2009 (FV) and 20–21 April 2009 (FER), where the species was photographed (Fig. 4) and sound-recorded. These are the first data on the elevational range and status of the species on Peleng. The Peleng population is currently ascribed to nominate *P. p. platurus* from Sulawesi, whilst those in the Sula archipelago are treated as an endemic subspecies *P. p. sinerubris* (White & Bruce 1986, Coates & Bishop 1997). However, birds on Peleng possess a distinctive grey cast to their wing-coverts (Fig. 4; see also Indrawan *et al.* 1997) that we have neither seen in nominate birds from Sulawesi nor in *P. p. sinerubris* from Taliabu (FV & FER pers. obs.). The population on Peleng might constitute an undescribed endemic subspecies.

SULA HANGING PARROT *Loriculus sclateri ruber*

Common in most habitats in montane western Peleng, ranging from coconut plantations to primary forest, from sea level to almost 900 m (FV, FER; 22–31 March 2009). Also common in degraded lowland forest near sea level around Salakan in eastern Peleng on 5–8 April 2009 (FV) and 20–21 April 2009 (FER), where it was photographed and sound-recorded (FV). MI, DDP & AR commonly observed the species in a similar range of habitats on Peleng during 18 January–9 February 2008 and 23 March–13 April 2009. We follow Collar (2007) in recognising the two distinct taxa from Sula and Banggai as *L. sclateri*, separate from Moluccan Hanging Parrot *L. amabilis*. Because of its recent recognition as a species, there have been few previous data on the elevational range and status of Sula Hanging Parrot. Indrawan *et al.* (1997) commonly saw the species in the lowlands but also encountered one at 600 m on Peleng. Davidson *et al.* (1991) encountered it only to 250 m on Taliabu, but it has subsequently been found above 700 m (Rheindt 2010). Our Peleng sightings confirm the broad elevational and habitat tolerance of this versatile species.

MOLUCCAN KING PARROT *Alisterus amboinensis versicolor*

Singles, pairs and small groups of 3–4 were occasionally seen in montane western Peleng at 800–900 m (MI; 2004, 2006, 2007), and 1–2 seen on only three occasions in secondary or primary forest in montane western Peleng at *c*.850–900 m (FE, FV; 25–30 March 2009). FV also photographed and sound-recorded the species in disturbed forest near sea level around Salakan in eastern Peleng (5–8 April 2009). Represented on Peleng by the endemic *A. a. versicolor* (White & Bruce 1986, Coates & Bishop 1997), but no data have been published on this subspecies' elevational range and status. It may be widely overlooked due to its cryptic and retiring nature and / or partially nocturnal behaviour (MI pers. obs.).

DRONGO CUCKOO *Surniculus lugubris musschenbroeki*

Repeated bouts of this species' distinctive ascending call series were heard in degraded secondary forest near Salakan in eastern Peleng at *c*.100 m (FER; 20–21 April 2009). This is the first record for the Banggai Islands (White & Bruce 1986, Coates & Bishop 1997). Although the call was not sound-recorded, confusion with other species can be eliminated given the unmistakable vocalisations of *S. lugubris* (a repeated series of level notes swiftly ascending the scale at roughly equal frequency intervals, unlike any other cuckoo's vocalisations). The species occurs on adjacent Sulawesi (Coates & Bishop 1997) and has presumably been overlooked in Peleng by previous workers, perhaps because *S. lugubris* is silent for much of the year.

OWL *Tyto* sp.

On 26 March 2009 at 19.00 h, FV & FER heard once but failed to sound-record a nearby *Tyto* in primary forest above 900 m in western Peleng. FER considered it to have a distinct hissing quality strongly reminiscent of Minahassa Masked Owl *T. inexspectata* and unlike the more screeching Sulawesi Masked Owl *T. rosenbergii*. However, FV was sceptical of the identity. Independently, on 4 April 2009, FV heard a *Tyto* vocalisation that he considered consistent with *T. rosenbergii* in an agricultural area near forest edge at 550 m, in an area of western Peleng where villagers are familiar with this sound. During various surveys of secondary forest, cultivation and open habitat in western Peleng from sea level to *c*.700 m, MI has heard *Tyto* vocalisations, presumably *T. rosenbergii*, which he described as 'not hissing, but more prominent screeching, like a door on a rusty hinge'. According to White & Bruce (1986) and Coates & Bishop (1997), the genus *Tyto* is represented on Peleng by the endemic *T. rosenbergii pelingensis*. The location where FV & FER heard the owl on 26 March 2009 was in primary forest >4 km from the nearest degraded areas. All other records were made in or near open or secondary habitat, and were considered (by the observers, FV & MI, respectively) consistent with the screeching vocalisation of *T. rosenbergii*. The occurrence of *Tyto* owls inside dense forest on Peleng raises the possibility that two *Tyto* taxa occur on the island. On Sulawesi, *T. rosenbergii* is usually known from open habitat and light woodland, being replaced in the forest interior by *T. inexspectata*. An important first step in elucidating the taxonomic affinities of *Tyto* owls on Peleng is to analyse the type of *pelingensis* in comparison with other taxa, and to acquire photographs or specimens of *Tyto* owls in different habitats on Peleng.

BANGGAI SCOPS OWL *Otus mendeni*

Common in degraded woodland to primary forest from sea level to over 900 m in western Peleng (FV, FER; 22–31 March 2009). During various visits to western Peleng, MI heard its call practically every night. Also heard and seen in the degraded lowlands of eastern Peleng (FV; 5–8 April 2009). It was photographed and sound-recorded (FV, MI). Our records provide the first data on the elevational range and habitat tolerance of this species. Taxonomic controversy has surrounded scops owls on the Banggai Islands (Indrawan *et al*. 1997). Banggai Scops Owl is often considered a subspecies of Moluccan Scops Owl *O.*

magicus (e.g. Coates & Bishop 1997). However, its vocalisations differ dramatically from the latter and from Sulawesi Scops Owl *O. manadensis*. It presumably has much closer affinities to Sula Scops Owl *O. sulaensis*, itself usually considered a subspecies of *O. magicus*. Sula and Banggai Scops Owls are each afforded species status by a forthcoming taxonomic proposal partially based on the vocal and photographic material obtained during our work on Peleng (King *et al.* in prep.).

WHITE-THROATED NEEDLETAIL *Hirundapus caudacutus*

Approximately six singles and a flock of 15+ seen in western Peleng at *c*.750 to over 900 m (FV & FER; 25 March–4 April 2009). Most sightings were prolonged and the observers confirmed the presence of an extensive white throat, which eliminates the unlikely Purple Needletail *H. celebensis* of Sulawesi and the Philippines, and Silver-backed Needletail *H. cochinchinensis*, which breeds in mainland Asia and winters south-east to Java. One was photographed. These records are the first for the Banggai Islands. However, the species is a widespread passage migrant in Wallacea (White & Bruce 1986, Coates & Bishop 1997), making occurrence on Peleng unsurprising. The lack of previous records is presumably due to low observer activity.

SULAWESI SWIFTLET *Aerodramus sororum*

On 27 March 2009, from a primary forest clearing above 900 m, FER & FV observed a swiftlet flock containing *c*.10 *A. sororum* and 20 Uniform Swiftlets *A. vanikorensis*, as well as periodically several Glossy Swiftlets *Collocalia esculenta*. Subsequently, monospecific flocks of *A. sororum* were seen and photographed at sea level in western Peleng on 31 March 2009 (FER, FV). These are the first records of Sulawesi Swiftlet on the Banggai Islands. Identification was made under optimal conditions and involved direct comparison with the two other species. We follow Rheindt & Hutchinson (2007) in recognising the distinctive Sulawesi taxon *A. sororum* as a separate species from Halmahera Swiftlet *A. infuscatus* and Seram Swiftlet *A. ceramensis*. The birds we saw in Peleng were identical to *A. sororum* in their pale rump, eliminating confusion with the much darker rumped *A. infuscatus* of adjacent northern Maluku.

UNIFORM SWIFTLET *Aerodramus vanikorensis*

On 27 March 2009, from a primary forest clearing above 900 m, FER & FV observed a swiftlet flock containing *c*.20 *A. vanikorensis* and *c*.10 Sulawesi Swiftlets, as well as periodically several Glossy Swiftlets *Collocalia esculenta*. This is the first record of *A. vanikorensis* on the Banggai Islands. Identification was made under optimal conditions and involved direct comparison with the other two species. Compared to *C. esculenta*, the larger size and uniform dark underparts were noted, whilst unlike *A. sororum* the rump was concolorous with the rest of the upperparts. The absence of a pale rump was confirmed in good light on individuals at close range and directly compared with *A. sororum* at the same distance. We can therefore eliminate other swiftlets known from the region. The taxonomic affinities of Uniform Swiftlet on Peleng require investigation. On the adjacent Sulawesi mainland, the species is represented by *A. v. aenigma*, which might breed in the Banggai archipelago or visit Peleng on foraging trips.

COLLARED KINGFISHER *Halcyon c. chloris*

As well as numerous observations in the lowlands, the species was commonly seen and heard in degraded woodland and secondary forest to *c*.900 m in western Peleng (FV & FER, 22–31 March 2009; MI, 27 April–17 May 2007). The species has a wide elevational range from sea level to 1,850 m on Sulawesi (White & Bruce 1986, Coates & Bishop 1997). These are the first altitudinal data for the species on the Banggai Islands.

RUDDY KINGFISHER *Halcyon coromanda pelingensis*

Common in degraded lowland forest near sea level in eastern Peleng on 5–8 April 2008 (FV) and 20–21 April 2008 (FER), where it was sound-recorded and photographed (FV). On 24 March 2009, it was seen in old secondary forest in the highlands of western Peleng at *c.*750 m (FV). On the Banggai Islands, Ruddy Kingfisher is represented by the endemic *H. c. pelingensis* (White & Bruce 1986, Coates & Bishop 1997). Our records considerably extend its elevational range in Wallacea. *H. c. rufa* on Sulawesi has been recorded to 200 m (Coates & Bishop 1997), whilst *H. c. sulana* on Taliabu is known to 500 m (Rheindt 2010).

RED-BELLIED PITTA *Pitta erythrogaster dohertyi*

Heard on a daily basis in tall forest at *c.*550–750 m in montane western Peleng (FV, FER; 22–31 March 2009), although only one was seen well and photographed. During subsequent visits to the degraded lowlands near Salakan in eastern Peleng (5–8 April 2009, FV; 20–21 April 2009, FER), the species was commonly heard. FV obtained sound-recordings (Fig. 5) and photographs. *P. erythrogaster* is represented on the Banggai and Sula islands by the somewhat distinct-looking endemic *P. e. dohertyi* (Bruce & White 1986, Coates & Bishop

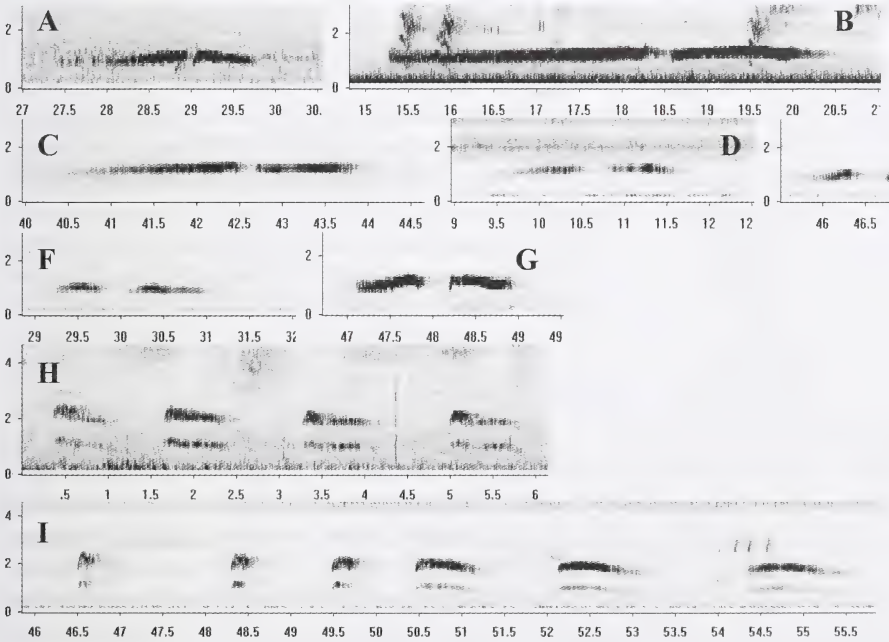


Figure 5. Sonograms of Red-bellied Pitta *Pitta erythrogaster* vocalisations on Peleng sound-recorded by the authors, and on neighbouring islands for comparison. X-axis = time in seconds (0.5 seconds per tick), y-axis = frequency in kHz (2 kHz per tick). A–G involve the conventional disyllabic call, H–I refer to a less common secondary call, but both call types are given by *P. e. dohertyi* on Peleng / Taliabu and by subspecies on neighbouring islands. Note the great variability in duration and element spacing in the disyllabic call (A–G), even within members of the same subspecies (e.g. B–D). A: Talaud Islands (*P. e. inspeculata*), by F. Verbelen, in March 1997. B: Tangkoko National Park (North Sulawesi; *P. e. celebensis*), by B. Demeulemeester (date unknown). C: Tambun (North Sulawesi; *P. e. celebensis*), by B. Demeulemeester (date unknown). D: Batudaka (Togian Islands; *P. e. celebensis*), by F. Verbelen, in December 2008. E–F: Peleng Island (*P. e. dohertyi*), by F. Verbelen, in March 2009. G: Taliabu (Sula Islands; *P. e. dohertyi*), by F. Verbelen, in March 1997. H: Talaud Islands (*P. e. inspeculata*), by F. Verbelen, in March 1997. I: Peleng Island (*P. e. dohertyi*), by F. Verbelen, in March 2009.

1997, Indrawan *et al*. 1997, Erritzoe 2003). The only previous information on the elevational range of this taxon is from Taliabu, where it has been reported as occurring from sea level to 600 m (Rheindt 2010).

P. e. dohertyi has undergone a chequered taxonomic history. Most pre-1990 authorities, as well as Coates & Bishop (1997) and Erritzoe (2003), considered it a subspecies of *P. erythrogaster*. However, Sibley & Monroe (1990), Davidson *et al*. (1991) and Lambert & Woodcock (1996) considered *dohertyi* a separate species based on its head coloration, other minor plumage details, and its allegedly distinctive vocalisation, which the latter authors described as dissimilar to other taxa in the *P. erythrogaster* complex. Erritzoe (2003) dismissed the plumage differences as insufficient for species status because plumage variation in other subspecies of *P. erythrogaster* is also considerable. It appears that Lambert & Woodcock's (1996) description of its 'distinctive call' was apparently based on a poorly known secondary vocalisation also given by all neighbouring subspecies (see their sonogram and Fig. 5H–I). *P. e. dohertyi* on Peleng (Fig. 5E–F) and Taliabu (Fig. 5G) also give the same main disyllabic call as *P. erythrogaster* elsewhere in its range (Fig. 5A–D). Slight differences in duration and note spacing are apparent between *P. e. dohertyi* and other subspecies, but these are no more pronounced than between (and even within) other subspecies of *P. erythrogaster* (Fig. 5). In fact, vocal variation can be quite pronounced even individually, depending on the bird's level of agitation (FER & FV pers. obs.; R. O. Hutchinson *in litt*. 2009). For this reason, we reject any split of *P. e. dohertyi*. A thorough genetic analysis is needed before considering the division of *P. erythrogaster* into more than one species.

SLATY CUCKOOSHRIKE *Coracina schistacea*

Five observations of family groups of 3–4 birds in secondary and primary forest in montane western Peleng at *c*.750 m to over 900 m (FV, FER; 23 March–4 April 2009), where the species was photographed and sound-recorded (FV). On 7 October 2004, MI observed a pair at *c*.450 m near Alani and—on subsequent days—he occasionally saw individuals in the south-east of western Peleng at *c*.900 m. Considered primarily a lowland species, *C. schistacea* is endemic to the Banggai and Sula islands (White & Bruce 1986, Coates & Bishop 1997) and had previously been recorded to just 200 m on the Banggai Islands (Indrawan *et al.* 1997).

COMMON CICADABIRD *Coracina tenuirostris pelingi*

A female was seen at the summit of Kramat Mountain (in the south-east of western Peleng), and a pair was subsequently observed slightly lower at *c*.700 m (MI; 4 May 2007). One to seven individuals were seen on approximately six occasions in degraded to tall forest in montane western Peleng at *c*.650–850 m (FER, FV; 22–31 March 2009), where the species was photographed (Fig. 6) and sound-recorded. It was also seen in eastern Peleng near sea level on 5–8 April 2009 (FV) and 20–21 April 2009 (FER). On the Banggai Islands, the species is represented by endemic *C. t. pelingi*, for which no elevational data have been published (Coates & Bishop 1997). *C. t. pelingi* and the equally isolated *C. t. obiensis* from Obi Island are characterised by an extremely divergent female plumage that bears little resemblance to female plumages of other members of the complex (Fig. 6; Coates & Bishop 1997). Future work may confirm that the distinctiveness of *C. t. pelingi* is supported by genetic, acoustic or other morphological data, which might lead it to be considered specifically. Current taxonomy divides the species into *c*.30 races, and a complete taxonomic review is surely needed.

SULAWESI TRILLER *Lalage leucopygialis*
A male was seen atop a bare tree in cultivation near the forest edge, at *c.*550 m, near Kokolomboi in western Peleng (MI; 6 October 2006). A silent male was photographed in a mixed-species canopy flock in secondary forest at *c.*750 m in western Peleng (FER, FV; 24 March 2008). Previously recorded from Peleng, but its elevational range there was unknown (White & Bruce 1986, Coates & Bishop 1997). On Sulawesi, it ranges to 1,000 m, whilst on Taliabu (Sula Islands) it has not been seen higher than *c.*200 m (Davidson *et al.* 1991, Stones *et al.* 1997, Coates & Bishop 1997; FER pers. obs.).

HAIR-CRESTED DRONGO *Dicrurus hottentottus banggaiensis*
Common in degraded woodland to tall forest from sea level to at least 750 m in montane western Peleng (FV, FER; 22–31 March 2009) and in the lowlands of eastern Peleng (FV, 5–8 April 2009; FER, 20–21 April 2009). It was photographed (Fig. 7) and sound-recorded (FV). During his visits to Peleng, MI has recorded the species on a near-daily basis, mostly in the lowlands but also in the montane west. The regional classification of the Hair-crested Drongo is complicated, and current taxonomy may not do the evolutionary history of this complex justice (see Rheindt & Hutchinson 2007). Following older treatments, White & Bruce (1986) and Coates & Bishop (1997) attributed populations on the Banggai Islands to the Sulawesi subspecies *D. h. leucops*, which is distinct from most other races in having a strikingly white iris. White & Bruce (1986) explicitly mentioned that Banggai birds had previously been accorded subspecific status as *D. h. banggaiensis* due to their 'having a brown rather than white iris, but there is doubt as to the validity of this'. However, Indrawan *et al.* (1997) remarked that—although most birds they saw in the lowlands of the Banggai archipelago were white-eyed—several with brown irises were observed as well. This situation is akin to that on other satellite islands of Sulawesi, where *D. h. leucops* is supposedly present but dark-eyed birds occur, e.g. on Siau (FV & FER pers. obs.). Indrawan *et al.* (1997) suggested that brown-eyed birds in the Banggai Islands may belong to the previously unrecorded Spangled Drongo *D. bracteatus*. However, as there seems to be no cogent rationale for the taxonomic treatment that divides drongo populations in Wallacea into *D. bracteatus* in the east and *D. hottentottus* in the west (Rheindt & Hutchinson 2007), we suggest that the classification of brown-eyed birds in Banggai as *D. bracteatus* is unhelpful.

Curiously, the great majority we saw in western Peleng above 400 m had grey to brown irides (Fig. 7), unlike the predominantly white-eyed birds observed in the lowlands by Indrawan *et al.* (1997). However, we also saw one or two individuals with very pale eyes, described as off-white. We observed birds with different eye colours together and giving identical vocalisations. Therefore, we doubt that the situation on Peleng mirrors that on Sulawesi, where a pale-eyed drongo species from the lowlands (*D. h. leucops*) and a dark-eyed montane species (Sulawesi Drongo *D. montanus*) replace each other. Instead, we assume there is one drongo species on Peleng that displays a range of eye colours, with dark irides predominating at higher elevations. Eye colour did not appear to be related to age, since vocally displaying adults with different eye colours were seen.

One explanation for the variability of eye colours on Peleng could be varying selectional pressures along an elevational gradient, with pale eyes being selected over dark eyes at lower elevations and vice versa. A second scenario for the variability of eye colours on Peleng could be the ongoing gradual introgression of a newly colonising taxon, presumably white-eyed *D. h. leucops* of Sulawesi, into the ancestral Peleng drongo *D. h. banggaiensis,* which is perhaps closely related to brown-eyed *D. h. pectoralis* of Sula. Although only 14 km distant, Peleng and Sulawesi are divided by a deep-sea trench (Becker *et al.* 2009) that has never permitted land connections to form during glacial sea-level fluctuations that recur every *c*.100,000 years (Lambeck & Chappell 2001, Siddall *et al*. 2003, Bintanja *et al*. 2005, Thompson & Goldstein 2005, Caputo 2007). On the other hand, sea levels between Sula and Banggai / Peleng are sufficiently shallow for landbridges to arise during glacial periods (Becker *et al*. 2009). This potential scenario entails that dark-eyed populations of *D. h. banggaiensis* could be facing slow and gradual introgression on Peleng by colonising *D. h. leucops* from Sulawesi. The predominance of white-eyed birds in the lowlands of Peleng would also agree with this scenario, since colonisers would probably become established in the lowlands first. This taxonomic puzzle demands genetic elucidation. Meanwhile, we suggest that the previous treatment of drongos on the Banggai Islands as *D. h. banggaiensis* should be maintained until and unless further data prove this arrangement to be erroneous.

NORTHERN GOLDEN BULBUL *Thapsinillas longirostris harterti*
Occupies a wide spectrum of habitats, from undisturbed primary forest to degraded scrub and from sea level to over 900 m in montane western Peleng (FER, FV; 22–31 March 2009). Also seen in degraded lowland forest near sea level in eastern Peleng on 5–8 April (FV) and 20–21 April 2009 (FER). It was photographed and sound-recorded. Furthermore, MI, DDP & AR observed the species in a similar range of habitats and elevations on a near-daily basis during their multiple visits. Elevational data on *T.1. harterti*, which is endemic to the Banggai Islands, have been lacking. Our records reveal that it occurs across the entire elevational spectrum on Peleng. We follow Fishpool & Tobias (2005) and Rheindt & Hutchinson (2007) in considering taxa from the northern Moluccas, Banggai, Sangihe and Togian islands as a species, *T. longirostris*, separate from taxa in the southern Moluccas, but future research will probably reveal the existence of several species-level taxa with different plumage and vocalisations within *T. longirostris*—akin to the species-level differences shown between taxa that comprise Southern Golden Bulbul *T. affinis* (Rheindt & Hutchinson 2007).

BLACK-NAPED ORIOLE *Oriolus chinensis frontalis*
Photographed and sound-recorded regularly in forest and woodland from sea level to *c*.850 m on western Peleng (FV, FER; 22–31 March 2009). Encountered regularly in degraded lowland forest in eastern Peleng on 5–8 April (FV) and 20–21 April 2009 (FER). The population on the Banggai Islands is included within *O. c. frontalis* along with those on the Sula archipelago (White & Bruce 1986, Coates & Bishop 1997). Whilst the widespread Sulawesi *O. c. celebensis* ranges into the mountains, *O. c. frontalis* had been reported from sea level only to *c*.300 m on Taliabu (Davidson *et al*. 1991, Coates & Bishop 1997, Stones *et al*. 1997). Our montane records on Peleng—along with recent observations from Taliabu to 800 m (Rheindt 2010)—establish that *O. c. frontalis* resembles other regional subspecies in its elevational range.

BANGGAI CROW *Corvus unicolor*
Recorded repeatedly by all authors. Details on the rediscovery of this species are published elsewhere in this issue (Indrawan *et al*. 2010, Mallo *et al*. 2010).

SLENDER-BILLED CROW *Corvus enca*
Common in coconut plantations and other agricultural land from sea level to *c*.300 m in western Peleng (FV & FER, 22 and 31 March 2009; MI, numerous records, including 18 January–9 February 2008 and one at *c*.400 m at Alani on 7 October 2004). During a visit to montane western Peleng, one was seen above 900 m, flying overhead at a height of *c*.50 m, in undisturbed primary forest (FER, FV; 27 March 2009). The latter sighting clearly involved *C. enca* and was made within minutes of seeing several *C. unicolor*, which species is expected at

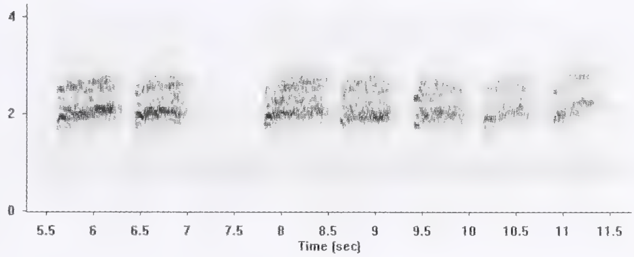


Figure 8. Sonogram of the calls of Slender-billed Crow *Corvus enca* recorded at sea level on Peleng. X-axis = time (0.5 seconds per tick), y-axis = frequency (2 kHz per tick). Recording by F. E. Rheindt.

higher elevations in undisturbed forest. This *C. enca* was presumably crossing the area without intending to land. Subsequently, *C. enca* was seen in degraded scrub near sea level in eastern Peleng on 5–8 April 2009 (FV) and 20–21 April 2009 (FER), where it was sound-recorded (Fig. 8) and photographed (Fig. 9).

White & Bruce (1986) and Coates & Bishop (1997) did not list *C. enca* for the Banggai Islands, although Coates & Bishop (1997) noted that crows seen near habitation on Banggai and Peleng might pertain to this species. Indrawan *et al.* (1997) also reported the presence of a *Corvus* in the lowlands of the Banggai Islands that presumably referred to this species, but they too left the identity open. However, *C. enca* was identified on Peleng and Banggai in 2005 during searches for *C. unicolor* (B. King *in litt.* 2006, http://www.kingbirdtours.com/news.html). *C. enca* appears to be a common resident of disturbed lowland habitat on the Banggai archipelago. It is unknown whether this population belongs to the Sulawesi subspecies *C. e. celebensis* or to Sula *C. e. mangoli*. Future bio-acoustic and morphological studies should seek to establish the taxonomic affinities of the Banggai population.

On Peleng, *C. enca* seems to replace endemic *C. unicolor* in disturbed lowland habitat. The lack of historic records of *C. enca* on Peleng and Banggai may indicate recent colonisation following anthropogenic habitat modification. However, this hypothesis requires further research given that older villagers in western Peleng claim that 'the big lowland crow' was also present during their childhood, when undisturbed forest dominated low elevations on Peleng.

RED-AND-BLACK THRUSH *Zoothera mendeni*

A single—caught by local people who consider this bird uncommon—was given to MI on *c.*16 June 2008 at a locality in western Peleng between 150 m and 500 m. Prior to this, Y. Masala, a member of MI's party, observed one near Bobonggon on 4 May 2007. During their nine-day visit to montane western Peleng, FER & FV observed this bird only three times, on 22–26 March 2009 at *c.*450–650 m in secondary forest. FV sound-recorded the call note. Their sightings were made in small forest patches at the upper edge of the agricultural belt, presumably in the only suitable habitat locally remaining within the species' elevational range, which may not reach much higher. In the degraded lowlands near Salakan in eastern Peleng on 21 April 2009, FER sound-recorded (Fig. 10) and photographed (Fig. 11) one in a small patch of moderately undisturbed secondary forest at *c.*100 m.

We follow Collar's (2004) proposal to regard *Z. mendeni* as specifically distinct from the very different-looking Red-backed Thrush *Z. erythronota* of Sulawesi. We also employ Collar's (2004) name, Red-and-black Thrush, rather than the more widespread English name Peleng Thrush. Although the species has to date only been recorded on Peleng within the Banggai archipelago, the latter name is unsuitable, because Davidson *et al.* (1991) discovered a new *Zoothera* population on Taliabu (Sula Islands) which on present evidence is doubtfully distinct from *Z. mendeni* (Collar 2004).

Nothing has been published concerning the elevational range of *Z. mendeni* on Peleng, except that the type specimen was taken at 300 m (Clement & Hathway 2000).

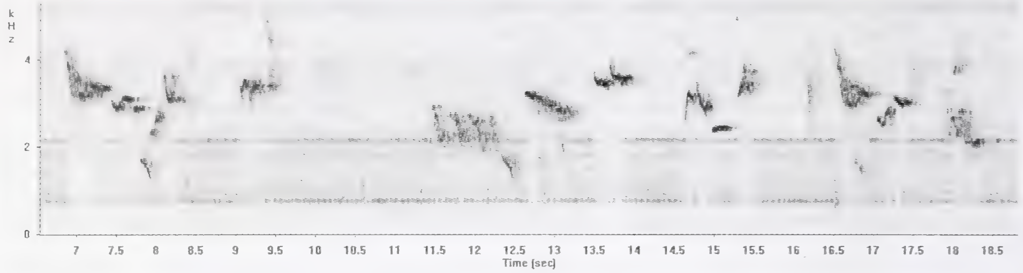


Figure 10. Sonogram of the song of Red-and-black Thrush *Zoothera mendeni* recorded at 100 m on Peleng. The song is a strong, pleasing, melodious warble. X-axis = time (0.5 seconds per tick), y-axis = frequency (2 kHz per tick). Recording by F. E. Rheindt.

The vocalisation of *Z. mendeni* is undescribed. Our records establish that the species may principally be restricted to lowland forest below 650 m, and might therefore be at risk due to the wholesale clearance of lowland forest on Peleng. The song (Fig. 10) is a very strong, melodious, pleasing and liquid series of notes typical of *Zoothera* dawn songs. It is similar to descriptions of the song of *Z. erythronota*, which has apparently not been sound-recorded (Clement & Hathway 2000). The call was a very high-pitched, typical *Zoothera*-like *pseeeeeeee*.

SNOWY-BROWED FLYCATCHER *Ficedula hyperythra* (undescribed subspecies?)

Seen by DDP in montane western Peleng at 800–900 m: on 10 April 2009, one was found damaged in a mist-net, presumably having been predated by a mouse; it had briefly been seen in the field at the same location on 9 April. This is the first record for the Banggai archipelago. The species is common in montane Sulawesi to the north and west (White & Bruce 1986, Coates & Bishop 1997) and has been recorded on Taliabu in the Sula archipelago to the east (Davidson *et al.* 1991, Stones *et al.* 1997, Rheindt 2010). The subspecific identity of birds on Peleng is uncertain: those on Taliabu are believed to involve an undescribed subspecies (Davidson *et al.* 1991), which might mean that the Peleng population also deserves subspecific rank, unless subsumed with those on Taliabu or the adjacent taxon on Sulawesi.

GRAY'S GRASSHOPPER WARBLER *Locustella fasciolata*

On 23, 26 and 28 March 2009, a single was repeatedly heard giving its distinctive alarm call (Fig. 12) from a large weedy forest clearing at *c*.800 m (FV, FER). The same individual was probably involved on all three occasions. Twice (23 and 26 March), the bird was briefly seen. These are the first records of *L. fasciolata* on the Banggai Islands (White & Bruce 1986, Coates & Bishop 1997). Our sightings were brief but clearly involved a comparatively large

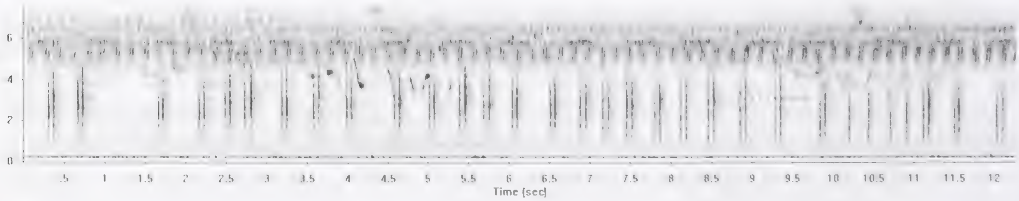


Figure 12. Sonogram of the distinctive alarm vocalisation of Gray's Grasshopper Warbler *Locustella fasciolata* recorded at 800 m on Peleng. The recording constitutes a rapid series of call doublets (*terreck-terreck, terreck terreck-terreck* . . .). Dark smudging at *c*.6 kHz is background noise of insects. X-axis = time (0.5 seconds per tick), y-axis = frequency (2 kHz per tick). Recording by F. Verbelen.

warbler with a bright white supercilium and solid brown (unstreaked) back. These details and the sound-recordings confirm its identification as *L. fasciolata* and preclude confusion with various *Megalurus* grassbirds, *Acrocephalus* reed warblers or *Bradypterus* bush warblers. A widespread winter visitor and passage migrant to northern Wallacea (Coates & Bishop 1997), its occurrence on the Banggai Islands is unsurprising; the lack of previous records is probably reflective of low observer activity and the species' shy behaviour.

MOUNTAIN TAILORBIRD *Orthotomus cucullatus* (undescribed subspecies?)
The species' distinctive song was heard commonly, and singles were seen occasionally, in primary and secondary forest in montane western Peleng between 750 m and over 900 m (FER, FV; 22–31 March 2009). These are the first records for the Banggai Islands (White & Bruce 1986, Coates & Bishop 1997). Identification of this vocally conspicuous species was confirmed by sound-recordings (Fig. 13). The taxonomic affinities of the Peleng population are undetermined. On Sulawesi, Mountain Tailorbird is represented by four very similar subspecies, one of which (*O. c. meisei*) occurs in mountains on the eastern peninsula adjacent to Peleng. However, a population has also recently been discovered in the mountains of Taliabu, which is thought to represent an endemic subspecies (Davidson *et al*. 1991, Coates & Bishop 1997). A revision of all subspecies in the region, including the two undescribed populations, will be required to determine the validity of taxa and the affinities of birds on Peleng and Taliabu.

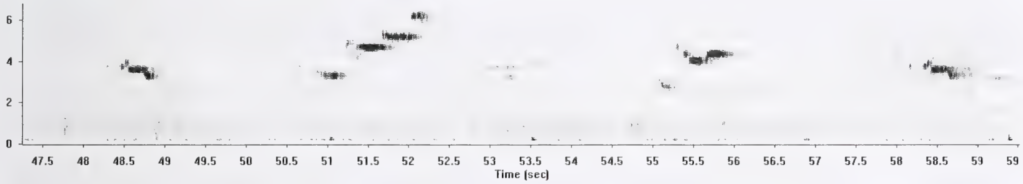


Figure 13. Sonogram of the song of Mountain Tailorbird *Orthotomus cucullatus* recorded *c*.850 m on Peleng. The song is a single, melodious, high-pitched (near-) level note or a rapid succession of 2–4 such notes on different frequencies. X-axis = time (0.5 seconds per tick), y-axis = frequency (2 kHz per tick). Recording by F. Verbelen.

ARCTIC WARBLER *Phylloscopus borealis*
Loose associations involving several individuals of this Palearctic migrant were observed and photographed on 5–6 occasions in disturbed woodland to primary forest at 600–850 m on western Peleng (FV, FER; 24 March–3 April 2009). They often associated with mixed flocks that also contained flowerpeckers (*Dicaeum*), honeyeaters (*Myzomela*) and an

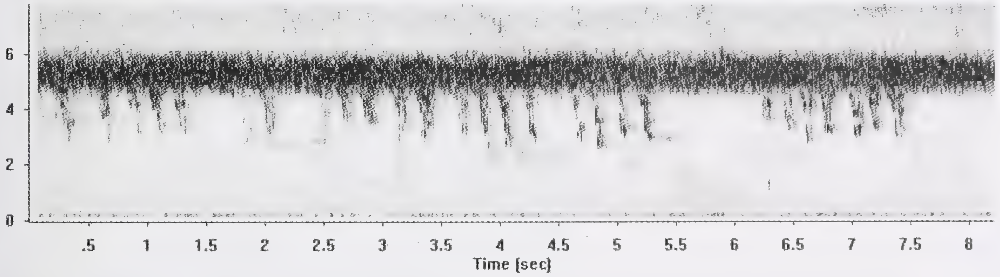


Figure 14. Sonogram of the song of Arctic Warbler *Phylloscopus borealis* recorded at *c*.750 m on Peleng. This vocalisation is a trill given principally during courtship on the breeding grounds. The black smudging at 5–6 kHz is sound pollution by insects. X-axis = time (0.5 seconds per tick), y-axis = frequency (2 kHz per tick). Recording by F. Verbelen.

undescribed leaf warbler (see following account). Identification was based on the white underparts, presence of one white wingbar and—primarily—song. The trill typically given on the Siberian breeding grounds during courtship was sound-recorded, confirming the identification (Fig. 14). Arctic Warbler is a widespread winter visitor to Wallacea, but has not previously been recorded in the Banggai Islands. Its occurrence here is unsurprising.

'PELENG LEAF WARBLER' *Phylloscopus* taxon novum

On 23–30 March 2009, FER & FV repeatedly observed groups, pairs and singles of a leaf warbler other than Arctic Warbler *P. borealis* or any other migratory species known in Indonesia. They were observed frequently in primary and secondary forest from 700 m to over 900 m, being slightly commoner at higher elevations, and one was photographed (Fig. 15). It often associated with other canopy species, such as honeyeaters (*Myzomela*), flowerpeckers (*Dicaeum*) and even *P. borealis*. When these two *Phylloscopus* were seen together, the present species was easily separated by its smaller size and distinct underparts coloration, with the yellowish lower breast and belly contrasting with the off-white throat and upper breast. It also behaved differently from the twig-feeding *P. borealis* by keeping to heavier branches, along which it crept like a treecreeper (*Certhia*). We acquired numerous sound-recordings which confirm that it does not belong to any potential migrant visitor.

The genus *Phylloscopus* has not previously been reported from the Banggai Islands (White & Bruce 1986, Coates & Bishop 1997). However, the mountains of adjacent Sulawesi are inhabited by Sulawesi Leaf Warbler *P. sarasinorum* (White & Bruce 1986, Coates & Bishop 1997), whilst there is a recently discovered but undescribed leaf warbler in montane Taliabu that perhaps belong to the Island Leaf Warbler *P. poliocephalus* complex (Davidson *et al.* 1991, Coates & Bishop 1997, Stones *et al.* 1997, Rheindt 2010). Preliminary comparison of photographs and sound-recordings suggests pronounced differences in underparts coloration and vocalisations between the 'Peleng Leaf Warbler', the undescribed Taliabu taxon and *P. sarasinorum*. The taxonomic affinity of the Peleng population requires acoustic, morphological and preferably genetic studies, incorporating all neighbouring taxa of the *P. sarasinorum* / *poliocephalus* complex, which might comprise up to a dozen species-level taxa (Rheindt & Hutchinson 2007); the undescribed forms on Taliabu and Peleng perhaps form part of this grouping. Detailed taxonomic research into the *P. poliocephalus* complex has been initiated with a view to resolving the position of some Indo-Papuan leaf warbler taxa (FER unpubl. data).

BLACK-FRONTED WHITE-EYE *Zosterops atrifrons subatrifrons*

Common in a variety of habitats ranging from degraded patches to primary forest, from sea level to above 900 m in western Peleng (FER, FV; 22–31 March 2009). Also encountered near-daily during multiple visits to the same area by MI & DDP. Subsequently, the species was found to be common near sea level in the east of the island on 5–8 April 2009 (FV) and 20–21 April 2009 (FER). FV obtained sound-recordings (Fig. 16), and he and DDP photographed the species on Peleng. The population on Peleng is ascribed to *Z. a. subatrifrons* (Rasmussen *et al.* 2000), for which few elevational data have been published. On Sulawesi, *Z. a. atrifrons* and *Z. a. surdus* range from sea level to 1,500 m (White & Bruce 1986, Coates & Bishop 1997), whilst *Z. a. sulaensis* on the Sula archipelago was thought to be restricted to the lowlands (Davidson *et al.* 1991, Coates & Bishop 1997, Stones *et al.* 1997) but has recently been found commonly to 1,100 m on Taliabu (Rheindt 2010). Our Peleng observations demonstrate that the elevational range of *Z. a. subatrifrons* is comparable to neighbouring taxa.

The taxonomy of *Z. atrifrons* has recently been revised (Rasmussen *et al.* 2000). Previously, most authors (e.g. White & Bruce 1986, Coates & Bishop 1997) had included Sangihe White-

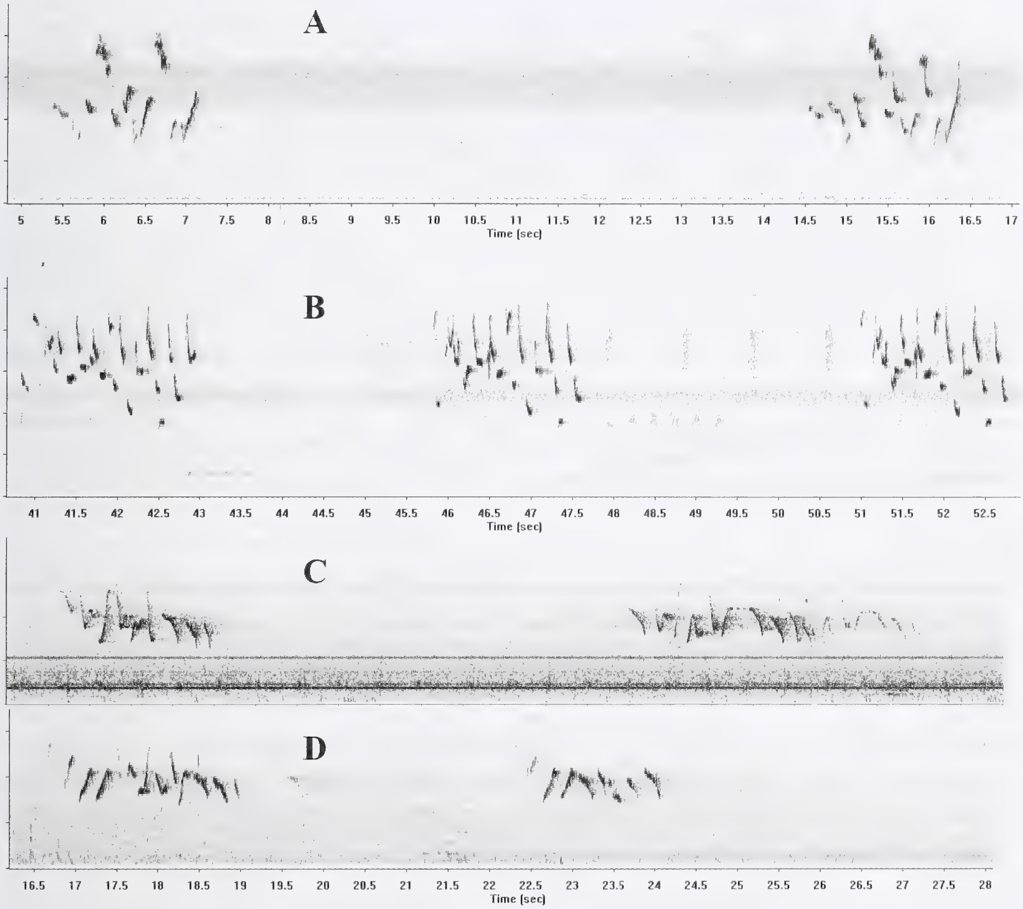


Figure 16. Sonograms of the dawn song of Black-fronted White-eye *Zosterops atrifrons* from (A) Peleng Island (*Z. a. subatrifrons*; F. Verbelen), (B) Gunung Ambang, North Sulawesi (*Z. a. atrifrons*; F. Verbelen), (C) and (D) Taliabu Island, Sula archipelago (*Z. a. sulaensis*; (C) F. E. Rheindt and (D) by P. Davidson & A. J. Stones). All sonograms are at equal scale. X-axis = time (0.5 seconds per tick), y-axis = frequency (2 kHz per tick). Dawn songs are principally but not exclusively uttered at dawn. Note the dramatic differences in song structure, frequency and number and shape of elements in the three taxa. The black smudging at *c.*1 kHz in (C) is mechanical sound pollution. Note that C and D were recorded at different sites on Taliabu at a 12-year interval.

eye *Z. nehrkorni* and Seram White-eye *Z. stalkeri* in *Z. atrifrons*, until Rasmussen *et al.* (2000) demonstrated that these forms merit biological species status on account of pronounced morphological and / or acoustic differences. Concerning *Z. a. sulaensis* and *Z. a. subatrifrons*, Rasmussen *et al.* (2000) noted close similarities in coloration, but conspicuous differences in eye-ring width and other colour details between the *Z. a. sulaensis / subatrifrons* group on the one hand and the two mainland Sulawesi taxa (*Z. a. atrifrons / surdus*) on the other. They pointed out that *Z. a. subatrifrons* from Peleng appears somewhat intermediate between Sulawesi and Sula populations in these characters (see also Indrawan *et al.* 2008), but that its much closer affinities with *Z. a. sulaensis* are undeniable. Rasmussen *et al.*'s (2000) acoustic material, which included samples of the dawn song of *Z. a. atrifrons* (North Sulawesi), *Z. a. surdus* (Central Sulawesi) and *Z. a. sulaensis* (Sula), but unfortunately not *Z. a. subatrifrons* (Peleng), suggested vocal similarities between the two Sulawesi taxa, which in turn differed greatly from *Z. a. sulaensis* in song structure and frequency. These authors asserted that if

Z. a. subatrifrons from Peleng did not exhibit a slight approximation in plumage characters towards the Sulawesi forms, 'the distinctiveness of *sulaensis* [and *subatrifrons*] both in morphology and in vocalizations as compared to the nominate is such that we would have unhesitatingly recommended specific status'. However, they were reluctant to propose a split, because 'if *sulaensis* were treated as specifically distinct, on morphology, *subatrifrons* must belong to the same species, and it is the name with priority. As we have no information on the vocalizations of *subatrifrons*, we are therefore presently unable to resolve this matter' (Rasmussen *et al.* 2000).

FV obtained numerous recordings of the dawn song of *Z. a. subatrifrons*, all of which possess an equal sound structure and frequency profile on sonograms (Fig. 16), confirming their taxonomic utility. Although Rasmussen *et al.* (2000) pointed to the vocalisations of *Z. a. subatrifrons* as the key to solving the unresolved puzzle surrounding the taxonomic rank of Sula and Banggai populations, our Peleng recordings provide no easy solution, as they do not clearly align with either their eastern (*Z. a. sulaensis*) or western / northern neighbours (*Z. a. surdus / atrifrons*). Note that our samples of *Z. a. atrifrons* and *Z. a. sulaensis* are virtually identical to sonograms in Rasmussen *et al.* (2000), although their recordings were not made at the same sites, thereby confirming dawn song as a reliable taxonomic character (Fig. 16). *Z. a. subatrifrons* from Peleng exhibits a song structure less complex than in *Z. a. atrifrons*, with only slightly more than 50% of the elements per song bout, and a mean frequency range that is lower pitched by *c.*1 kHz (4–9 kHz vs. 3–8 kHz). Even so, the shape of individual song elements in both taxa is similar, with a preponderance of descending hook-shaped notes at higher frequencies interspersed within a series of rising or punctual notes at lower frequencies (Fig. 16). Compared to *Z. a. sulaensis*, which displays an impoverished frequency range of 3–5 kHz, the song of *Z. a. subatrifrons* has pronounced differences in the shapes of individual elements, with ascending notes dominating over descending ones, although the number of elements per bout is roughly comparable between them (Fig. 16).

Therefore, the song of *Z. a. subatrifrons* proves to be equally distinct from *Z. a. atrifrons* as it is from *Z. a. sulaensis*, and thus bears no information pointing to its closest phylogenetic affinities. On the contrary, our recordings from Peleng suggest that *Z. a. subatrifrons* may deserve biological species rank, with *Z. a. sulaensis* also upgraded to species level. However, given the plumage similarities of the latter two (Rasmussen *et al.* 2000), we await further data, especially additional vocal samples from other parts of central (southern) Sulawesi, where an undescribed subspecies of *Z. atrifrons* has been reported (Rasmussen *et al.* 2000), before proposing such an arrangement.

HENNA-TAILED JUNGLE FLYCATCHER *Rhinomyias colonus pelingensis*

On 3 October 2006, scattered secondaries, tertials and filoplumes of this species (probably predated) were found in old secondary forest near its edge, at Bobonggon at *c.*520 m (MI). A nearby cup-shaped nest on a young pandan plant *c.*30 cm above the ground was believed to belong to this species. It contained two brown chicks *c.*6–8 cm long with black-streaked upperparts (MI). Subsequently, a second nest—of mosses, placed in a pandan and apparently recently abandoned—was found in primary forest at Kramat at *c.*800 m (MI). On 5 May 2007, an adult was mist-netted, measured, photographed and released at Lado (MI). During their trip to montane western Peleng (22–31 March 2009), FV & FER heard the species commonly, and observed it occasionally in primary forest and degraded woodland from sea level to *c.*850 m. In the lowlands of eastern Peleng on 5–8 April (FV) and 20–21 April 2009 (FER), it was heard and seen several times in degraded secondary forest. The species was photographed and sound-recorded (FV). *R. colonus* is probably endemic to the Sula and Banggai islands, although a specimen of doubtful provenance may be from eastern Sulawesi (White & Bruce 1986, Coates & Bishop 1997). On the Banggai Islands, it is represented by the endemic *R. c. pelingensis*, which has hitherto been recorded only on Peleng (Coates & Bishop 1997) and Labobo (Indrawan *et al.* 1997). It is generally unobtrusive (Davidson *et al.* 1991), and rare on Peleng, where Indrawan *et al.* (1993, 1997, 1998) did not find it during several weeks of field work (1993, 1998) in the low-lying east of the island. Its previous upper elevational limit had been reported as 300 m on Taliabu (Davidson *et al.* 1991, Stones *et al.* 1997; FER pers. obs.). Our records from Peleng reveal that *R. c. pelingensis* may differ from the nominate subspecies in its much broader elevational range. Our records also demonstrate that, once its pleasing melodious song is learned, this shy and inconspicuous species proves much commoner than previously assumed, and may possess a broad tolerance of habitat degradation.

BLACK-NAPED MONARCH *Hypothymis azurea blasii*

Common in primary forest to degraded second growth in western Peleng from sea level to over 900 m (FER, FV; 22–31 March 2009). MI, DDP & AR also recorded the species in a wide range of habitats and elevations throughout western Peleng on numerous occasions. In the lowlands of eastern Peleng (FV, 5–9 April; FER, 20–21 April 2009), it was common, and was photographed and sound-recorded. The population on Peleng is ascribed to *H. a. blasii* from the Banggai and Sula archipelagos (White & Bruce 1986, Coates & Bishop 1997, Indrawan *et al.* 1997). The elevational range of this subspecies had been reported as sea level to 300 m on Taliabu (Davidson *et al.* 1991, Coates & Bishop 1997, Stones *et al.* 1997), although it has since been observed up to 900 m (Rheindt 2010). Our records from Peleng reveal the altitudinal range of *H. a. blasii* to be much more akin to that of other subspecies than previously assumed.

CITRINE CANARY-FLYCATCHER *Culicicapa helianthea helianthea*

Common from *c.*750 m to over 900 m in secondary and primary montane forest in western Peleng (FV, FER; 22–31 March 2009). It was not observed in the lowlands. *C. h. helianthea* is known from Peleng, but data on its elevational range were lacking (White & Bruce 1986, Coates & Bishop 1997). On Sulawesi, it occurs to 2,300 m, although it is rather commoner above 500 m (Coates & Bishop 1997). Its primarily montane range on Sulawesi may be mirrored on Peleng. On Taliabu and Mangole, it was previously known only from the lowlands (Davidson *et al.* 1991, Stones *et al.* 1997, Coates & Bishop 1997), but it has recently been found on Taliabu to *c.*800 m (Rheindt 2010).

RUSTY-BELLIED FANTAIL *Rhipidura teysmanni* (undescribed subspecies?)

Seen occasionally and heard more frequently in secondary to primary montane forest in western montane Peleng at *c.*750–900 m (FER, FV; 23–30 March 2009). FV obtained sound-recordings (Fig. 17) and photographs. In the same area, DDP, AR & MI occasionally observed the species during several visits. These are the first records for the Banggai archipelago. The species is widespread in the Sulawesi highlands, where up to three subspecies are recognised: nominate *teysmanni* on the Lompobattang Massif in south Sulawesi, *toradja* in the mountains of central and south-east Sulawesi and *coomansi* on the northern Minahasa Peninsula. Furthermore, another subspecies, *sulaensis*, inhabits montane Taliabu. The population on Peleng closes a distributional gap between Sulawesi and the Sula archipelago.

The taxonomic affinity of the population on Peleng is contentious. In the field, all subspecies look extremely similar (Coates & Bishop 1997; FER pers. obs.), and the Peleng

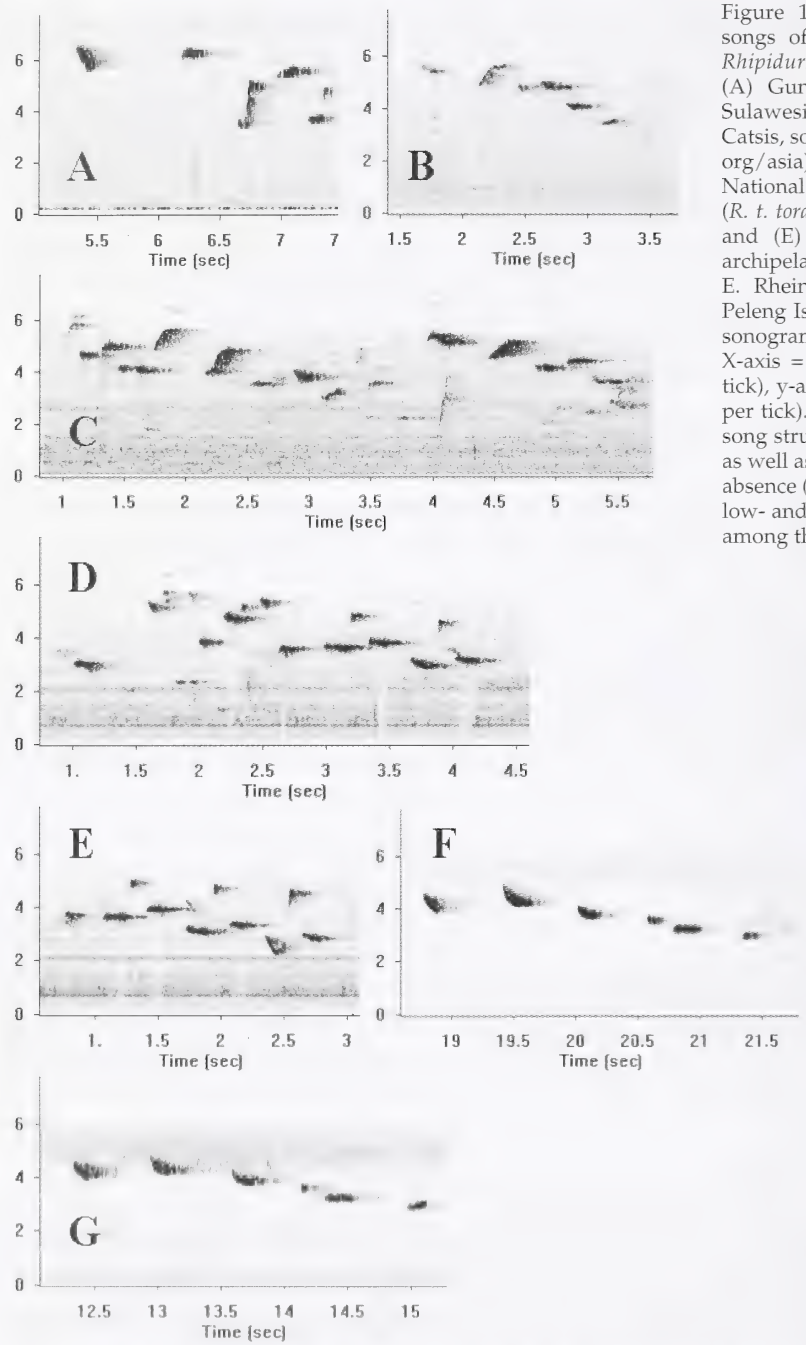


Figure 17. Sonograms of the songs of Rusty-bellied Fantail *Rhipidura teysmanni* from (A) Gunung Ambang, North Sulawesi (*R. t. coomansi*; M. Catsis, source www.xeno-canto.org/asia); (B) and (C) Lore Lindu National Park, Central Sulawesi (*R. t. toradja*; F. E. Rheindt); (D) and (E) Taliabu Island, Sula archipelago (*R. t. sulaensis*; F. E. Rheindt); and (F) and (G) Peleng Island (F. Verbelen). All sonograms are at equal scale. X-axis = time (0.5 seconds per tick), y-axis = frequency (2 kHz per tick). Note the difference in song structure, frequency range as well as presence (e.g. D, E) or absence (e.g. F, G) of alternating low- and high-pitched elements among the taxa.

population is no exception. At any given site, *R. teysmanni* has a large structural repertoire in songs, although most motifs clearly belong to the same general theme. Individual and agitation-specific variability necessitates a thorough acoustic analysis to assign Peleng birds subspecifically. However, a comparison of the major vocal features characteristic of some of the taxa provides some clues. Songs from northern and central Sulawesi consist of tinkling notes at *c.*3–7 kHz which can rapidly alternate between high- and low-pitched elements (Fig. 17A, C), although descending strophes are less common (Fig. 17B). In *sulaensis* from

Taliabu (Fig. 17D–E), the overall frequency is considerably lower than on Sulawesi (only *c*.2–5 kHz). At the same time, higher pitched notes in the song of *sulaensis* are less intense than on Sulawesi and only sporadically intersperse the stronger succession of lower pitched notes. The latter frequently end on a descending theme (Fig. 17D–E). This often-rigid sequence gives the song of *sulaensis* a lower pitched, more repetitive and less variable impression than that of *toradja* and *coomansi* from Sulawesi.

Compared to the Sulawesi and Sula taxa, the population on Peleng is vocally distinct. Throughout our time on Peleng, we have only noted a single constant song type comprising 4–7 ,descending notes falling from *c*.3–5 kHz (Fig. 17F–G). This song type lacks the interspersed higher pitched notes common in *sulaensis* (Fig. 17D–E) and also differs from the descending songs on mainland Sulawesi (Fig. 17B) by virtue of the much narrower frequency range and slower delivery. On account of its characteristic vocalisations, we suggest the Peleng population of *R. teysmanni* merits recognition at subspecies level. However, its description must await further analyses and the collection of specimens.

GOLDEN WHISTLER *Pachycephala pectoralis pelengensis*

One was mist-netted, measured and photographed near Lado at *c*.650 m (5 May 2007; MI). More recently, DDP trapped the species on several occasions in montane western Peleng. During their visit to the same area on 22–31 March 2009, FV & FER observed it commonly in degraded scrub to primary forest, from sea level to over 900 m. The species was also observed near sea level in lowland secondary forest and scrub on several occasions during the following weeks. The population on Banggai and Peleng is thought to represent an endemic subspecies *P. p. pelengensis* (White & Bruce 1986, Coates & Bishop 1997). Elevational data for this endemic subspecies have not been published to date. Our records reveal that *P. p. pelengensis* has a wide elevational range similar to that of neighbouring subspecies (Coates & Bishop 1997).

DRAB WHISTLER *Pachycephala griseonota*

Singles or pairs were seen on four occasions (24, 26 and twice on 28 March 2009) between 750 m and over 900 m in primary and old secondary forest in western Peleng (FER, FV). On 7 April 2009, FV photographed the species in a mixed-species flock in secondary forest in eastern Peleng near Salakan at *c*.100 m (Fig. 18). Ours are the first records in the Banggai archipelago. Identification of this drab and inconspicuous species was based on the birds' dark facial coloration contrasting noticeably with the pale throat (Fig. 18).

P. griseonota is considered endemic to the Moluccas (including Sula). It is represented by different subspecies on each of the major Moluccan archipelagos (White & Bruce 1986, Coates & Bishop 1997). The geographically proximate subspecies to Peleng is *P. g. lineolata* from the Sula Islands of Taliabu, Seho and Sanana (White & Bruce 1986, Coates & Bishop 1997). Subspecies of *P. griseonota* differ quite remarkably in their main body coloration and potentially in song (Coates & Bishop 1997; FER pers. obs. on Buru and Seram). We did not knowingly hear any *P. griseonota* on Peleng. However, the birds we observed strongly resembled those seen and photographed on Taliabu by FER only a few days later (Rheindt 2010). Based on this superficial resemblance, we suspect that the Peleng population is probably attributable to *P. g. lineolata* and does not deserve subspecific recognition, but this awaits confirmation.

HELMETED MYNA *Basilornis galeatus*

A few seen daily, and the species was photographed and sound-recorded from 700 m to over 900 m in western Peleng (FER, FV; 22–31 March 2009). Noted daily in the lowlands of Peleng on 5–9 April 2009 (FV) and 20–21 April 2009 (FER). Seen on numerous occasions at 500–800 m in western Peleng (MI) feeding on fruits in forest habitats, in flocks of up to 14 (2 October 2004). The species was usually seen in secondary forest with large clearings. Endemic to the Banggai and Sula islands (White & Bruce 1986, Coates & Bishop 1997), records on Banggai and Peleng had previously not exceeded 200 m (Indrawan *et al.* 1997). Our records reveal that the elevational range in the Banggai archipelago matches that on Sula, where it has been recorded to 1,100 m (Davidson *et al.* 1991, Coates & Bishop 1997, Stones *et al.* 1997; FER pers. obs.).

SULAWESI MYZOMELA *Myzomela chloroptera* (undescribed species?)
Males and females were seen and photographed almost daily at flowering shrubs and trees in clearings and the forest interior in western Peleng, from 700 m to over 900 m (FV & FER; 23–30 March 2009). These are the first records on Peleng, although K. D. Bishop saw an unidentified small honeyeater on Banggai Island in November 1981 (White & Bruce 1986). The identification of our birds was unambiguous, as there are no confusion species in the region with similar red (male) or red-faced (female) plumages.

We regard Sulawesi Myzomela *M. chloroptera* as specifically distinct from neighbouring taxa (e.g. Wakolo Myzomela *M. wakoloensis*, Banda Myzomela *M. boiei* and Scarlet Myzomela *M. sanguinolenta*) based on plumage differences (following Salomonsen 1967, Wolters 1979, Rheindt & Hutchinson 2007, Higgins *et al.* 2008). From our brief observations, the birds on Peleng did not noticeably differ from those on mainland Sulawesi and Taliabu (Sula Islands). The species was found on Taliabu <20 years ago and the discoverers suggested it might represent an undescribed subspecies (Davidson *et al.* 1991, Stones *et al.* 1997). Meanwhile, most authors have provisionally subsumed the Taliabu population under nominate *M. chloroptera* from north and central Sulawesi, whilst acknowledging that future research may reveal it to be a new subspecies (Coates & Bishop 1997, Higgins *et al.* 2008). Further studies are needed to determine whether the population on Peleng merits treatment as an endemic subspecies or should be included within the nominate race from Sulawesi. Alternatively, the Peleng birds may prove more closely related to the Taliabu population and may together form a novel subspecies.

BLACK SUNBIRD *Nectarinia aspasia auriceps*
Small numbers observed approximately once every two days at flowering shrubs and trees in habitats from degraded orchards to undisturbed montane forest in western Peleng, from sea level to over 900 m (FER, FV; 22–31 March 2009). Although previously recorded on Peleng, no elevational data have been published from there. Coates & Bishop (1997) placed the upper elevation on Sulawesi at 800 m, whilst Davidson *et al.* (1991) recorded the species to *c.*450 m on Taliabu. However, recent field observations indicate that these upper elevational limits for Sulawesi and Taliabu are too low by at least 300 m on both islands (FER pers. obs.). Our Peleng records reconfirm the broad elevational range of this taxon on smaller Wallacean islands.

GREY-SIDED FLOWERPECKER *Dicaeum celebicum sulaense*
Observed in a wide range of wooded habitats in western Peleng, from near sea level to above 900 m (FER, FV; 22–31 March 2009). MI encountered it over a similarly wide elevational and habitat range. The population on the Banggai Islands is attributed to *D. c. sulaense* which otherwise occurs in the Sula archipelago (White & Bruce 1986, Coates & Bishop 1997), and indeed the distinctive grey (rather than black) abdominal stripe of this subspecies was visible on several males. No previous elevational data have been published for the Banggai

Islands, although it occurs to 800+ m on Taliabu in the Sula Islands (Davidson *et al.* 1991, Coates & Bishop 1997, Stones *et al.* 1997).

Discussion

We provide details of 16 new bird records for the Banggai Islands, including at least one species ('Peleng Leaf Warbler' *Phylloscopus* taxon novum)—and potentially five subspecies—that may be new taxa to science. New island records generally pertain to montane species that have previously gone unnoticed because most field workers have operated mainly in the lowlands (*Ducula forsteni, Ptilinopus superbus, Orthotomus cucullatus, Myzomela chloroptera, Rhipidura teysmanni* and *Phylloscopus* taxon novum). On the other hand, several species might have been overlooked in the past due to their shy or inconspicuous nature, and because knowledge of their voice is prerequisite for detecting them (e.g. *Surniculus lugubris* and *Locustella fasciolata*). Other species may have avoided detection because they are difficult to identify in the field (e.g. *Aerodramus vanikorensis, A. sororum, Corvus enca, L. fasciolata, Phylloscopus borealis, Phylloscopus* taxon novum, and *Pachycephala griseonota*). One new record refers to a passage migrant that only occurs in the region during a short period (*Hirundapus caudacutus*), and two other new records pertain to species that may have expanded their ranges recently (*Hieraaetus kienerii* and *Streptopelia chinensis*).

Twelve of our 16 new bird records refer to species that occur both to the east (Sula Islands) and to the north / west (Sulawesi): *Hieraaetus kienerii, Ducula forsteni, Streptopelia chinensis, Hirundapus caudacutus, Aerodramus vanikorensis, A. sororum, Corvus enca, Locustella fasciolata, Phylloscopus borealis, Orthotomus cucullatus, Myzomela chloroptera* and *Rhipidura teysmanni*. These new records close an artefactual gap in their species' distributions. On the other hand, two of the new Banggai species are absent from the Sula archipelago, although they do occur on Sulawesi: *Ptilinopus superbus* and *Surniculus lugubris*. For these two, our new records establish a slight range extension from Sulawesi to its eastern satellite islands, although *P. superbus* also occurs on some of the northern Moluccas, rendering its absence on Taliabu even more surprising. Most significantly, one or two new Banggai records are of species that otherwise occur only to the east in the Sula archipelago and the Moluccas: *Pachycephala griseonota* and *Phylloscopus poliocephalus*. The latter is probably the species complex most closely related to the new 'Peleng Leaf Warbler' (unpubl. data). For these two species complexes, our new Banggai records constitute a considerable range extension from the Moluccas to Peleng in the immediate vicinity of Sulawesi.

Finally, our field work has uncovered new taxonomic information not only pertaining to the new *Phylloscopus* taxon, but also the uncertain taxonomic affinities of several Banggai birds. Observations and photographs highlight the confusing taxonomic situation in *Dicrurus hottentottus* and suggest that the current treatment of Banggai birds within Sulawesi *D. h. leucops* is flawed. Novel morphological data call into question previous taxonomic treatment of the Banggai population of *Prioniturus platurus*. A population of *Rhipidura teysmanni* on Peleng appears to be vocally distinct and—if corroborated—deserves recognition at subspecies level. Similarly, our vocal data are strongly suggestive of biological species status for *Zosterops* (*atrifrons*) *subatrifrons*, although we prefer to maintain subspecific treatment pending further data. Finally, sound-recordings demonstrate that *Pitta erythrogaster dohertyi* (occasionally treated as a species) should be treated at subspecific rank.

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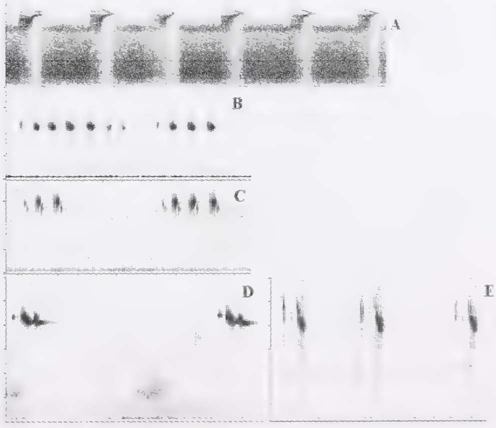
Appendix

Because Fig. 6 in Rheindt (2010, *Bull. Brit. Orn. Cl.* 130: 33–51) was not printed correctly, we take the opportunity to reproduce it here. Sonograms of vocalisations of *Bradypterus* bush warblers. X-axis = time in seconds (0.5 seconds per tick), y-axis = frequency in kHz (2 kHz per tick). All sonograms are at identical scale. (A) 'Taliabu' Bush Warbler *Bradypterus* sp. by F. E. Rheindt (April 2009, Taliabu); (B) Benguet Bush Warbler *B. seebohmi* by R. O. Hutchinson (February 2007, Mount Polis, Luzon, Philippines); (C) Russet Bush Warbler *B. mandelli* by D. Farrow (no date, Thailand, source: www.xeno-canto.org/asia); (D) Chestnut-backed Bush Warbler *B. c. castaneus* by P. Noakes (September 2006, Lore Lindu, central Sulawesi; source: www.xeno-canto.org/asia); (E) Chestnut-backed Bush Warbler *B. c. musculus* by R. O. Hutchinson (September 2006, Kobipoto Ridge, Seram). Dark areas below 5 kHz in sonogram A are mechanical sound pollution from equipment. Note that the undescribed Taliabu birds (A) more closely resemble *B. mandelli* (C) in terms of frequency (centred around 6 kHz), and resemble *B. mandelli* (C) and *B. seebohmi* (B) in exhibiting a single repeated call element, as opposed to the *B. castaneus* complex (D, E) whose vocalisations involve 2–3 call elements given in rapid succession. In acoustic impression, Taliabu birds are most similar but not identical to *B. mandelli*.



The eggs of the extinct Egyptian population of White-tailed Eagle *Haliaeetus albicilla*

by Golo Maurer, Douglas G. D. Russell, Friederike Woog & Phillip Cassey

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Summary.—Little is known concerning the biology of the now extinct Egyptian population of White-tailed Eagle *Haliaeetus albicilla*, and few specimens remain in museums to assess its alleged subspecific status. Here we describe three eggs collected near Lake Manzala and review the collection data and anecdotal reports about this species, to provide a better understanding of the biology of White-tailed Eagles in this southernmost part of their former breeding range.

White-tailed Eagle *Haliaeetus albicilla* is now a rare and irregular winter visitor to Egypt (Goodman & Meininger 1989), but has long been claimed as a former breeding bird at the lakes of lower Egypt (Meinertzhagen 1930, Cramp & Simmons 1980, Goodman & Meininger 1989). These claims are based solely on 19th-century published descriptions by the German explorers and ornithologists Martin Theodor von Heuglin (1824–76) and Alfred Edmund Brehm (1829–84), and observations by the British politician and agriculturalist, the Hon. Murray Finch-Hatton, 12th Earl of Winchilsea and seventh Earl of Nottingham (1851–98).

Until now, data on egg specimens in museum collections have not been used to corroborate breeding by White-tailed Eagle in Egypt. The recent discovery of a single Egyptian *H. albicilla* egg amongst unregistered material at the Natural History Museum (NHM), Tring, has provided the opportunity to re-examine evidence of breeding by *H. albicilla* in Egypt and to summarise published and specimen breeding data. In total, just three eggs of the Egyptian White-tailed Eagle are currently known in museums: the NHM Tring specimen and a clutch of two eggs held in Stuttgart at the Staatliches Museum für Naturkunde (SMNS).

Evidence of *Haliaeetus albicilla* breeding in Egypt

The isolation of the Egyptian population from the White-tailed Eagle's core range and its supposed morphological distinctiveness from northern populations led both Theodor von Heuglin (1856) and A. E. Brehm (1856) to describe it as a new species from the environs of Lake Manzala: *Haliaeetus cinereus* von Heuglin, 1856 (February) and *Haliaeetus funereus* A. E. Brehm, 1856 (May / June) (Fig. 1). Both names were first published as *nomina nuda* by Brehm's father, Christian Ludwig Brehm (Brehm 1855). Sharpe (1874) only noted the use by Ludwig Brehm, placing both *H. cinereus* and *H. funereus* in synonymy with *H. albicilla* (Linnaeus, 1758) where they have remained.

Travel in 1847–53 with Johann Wilhelm von Müller (as secretary and assistant) gave A. E. Brehm his first opportunity to collect and study the birds of Egypt. In an account on *Haliaeetus* species from Egypt, Brehm (1856) described White-tailed Eagles as follows: 'During winter one can see one of them regularly on the lakes of lower and central Egypt, which to me appears to differ from *Hal. albicillus*, which is why I consider it as a distinct, independent species. The bird stays in Egypt long into spring and, according to my Arab hunters, breeds at Lake Menzaleh [*sic*]' (translated from German by GM & FW).

At around the same time, in the early 1850s, von Heuglin also visited Egypt. His short (1856) description of White-tailed Eagles there stated: 'On the lakes of lower Egypt lives a white-tailed sea eagle, which may differ from the northern one or at least represent a constant climatic variety. Specifically, the adult bird is completely ash-grey and the white tail-feathers, namely the outer ones, are speckled brownish on their outer vanes. Furthermore it may generally have somewhat smaller proportions. Near Damiette [*sic*] it is called 'Óqab' [name in Arabic] or Shometta [name in Arabic] and breeds there on collapsed reed stems in *Arundo donax* [giant cane] etc.—Should it prove to be a new species, I suggest the name *Haliaëtos cinereus* for it.' (Translated from German by GM & FW.)

In his later account of Egyptian White-tailed Eagles, von Heuglin (1869) made no reference to either his or Brehm's 1856 taxonomic descriptions, but again alluded to the population's distinctiveness and behaviour: 'The white-tailed sea eagle of Egypt can perhaps be regarded as a separate, smaller, climatic variety. It lives, in our experience, as a resident around the lagoons of lower Egypt, namely on lake Mazalah [*sic*]. Usually one sees it in pairs, even during winter, when incidentally the number of these audacious raptors is perhaps augmented by northern visitors. [. . .] In the extensive reed-forests around the Behéreh (Lake Manzalah [*sic*] and surroundings) our bird builds its large nest in March. Here it often lacks suitable trees, it therefore resorts to the reed beds. In the tallest, densest and most impenetrable parts it folds reed stems in an area of a fathom until they form a solid basis for the actual nest which stands only a few feet above water level and is protected by overhanging reeds. A very large and flat nest stood on top of several acacia trees 2–3 feet in height, which shaded a low dune. We received a clutch with two almost un-incubated eggs; they are bluntly egg-shaped of 2″.7‴ in length by 2″.1‴ in width, somewhat rough-shelled, dirty blue-greenish white with a few washed-out brown blotches and at different parts, finely speckled dark brown. On the Red Sea or the actual Nile I have never encountered the sea eagle.' (Translated from German by GM & FW.)

Contradicting these descriptions of von Heuglin and Brehm, Saunders who examined skins obtained by Murray Finch-Hatton (Table 1) noted they were: 'very white around the head but not more so than in many European examples' (Meinertzhagen 1930). Von Heuglin gave some of his eggs collected in Africa to Richard Freiherr von Koenig-Warthausen for later description (Heuglin 1869). After his death in 1911, Koenig-Warthausen's egg collection remained at the residential castle of Sommershausen. In 1955, the collection comprising *c.*12,500 eggs was donated to the SMNS by Elisabeth Baronin von Koenig-Warthausen. This egg collection holds two likely candidate eggs (Fig. 2) and information on the label (in the hand of Koenig-Warthausen) stored with these eggs states:

Aegyptischer See=Adler, Haliaëtos albicilla ß cinereus v. Heugl.
Africa, Aegypten. Damiette [sic], 12 April 1861, 2 St. Gelege. Dr. Th. v. Heuglin.
Nest auf einem Hügelrücken auf Mimosengebüsch hoch aufgethürmt; brütet auch auf zusammen=geknickten Stengeln von *Arundo donax*.
(Der alte Vogel ganz aschgrau mit aussen bräunlich bespritzten Fahnen der weißen Schwanzfedern.)

Egyptian Sea Eagle, Haliaëtos albicilla var. cinereus v. Heugl.
Africa, Egypt, Damietta, 12 April 1861, two specimens [in] clutch. Dr. Th. v. Heuglin.
Nest on a ridge on a *Mimosa* shrub stacked tall; breeds also on folded stems of *Arundo donax*.
(The adult bird is ash-grey with outer vanes of white tail-feathers maculated brownish).
(Translated from the original German by GM & FW)

TABLE 1
Collection data and measurements of known skin and egg specimens of White-tailed Eagles *Haliaeetus albicilla* from the Egyptian population. The mean and minimum measurements in the two bottom rows are based on 150 *H. albicilla* eggs from the core breeding range (Schönwetter 1960–92).

Institution	Specimen	Register number	Collector	Locality	Date	Length mm (inches)	Breadth mm (inches)	Weight (g)
AMNH	Skin, Lectotype	535537	A. E. Brehm	L. Menzaleh	2.6. 1849			
Unknown	Skin, Holotype?	Unknown	Heuglin	Damiette	Unknown			
Unknown	Skin	Unknown	Finch-Hatton	L. Menzaleh	1873			
Unknown	Skin	Unknown	Finch-Hatton	L. Menzaleh	1873			
Unknown	Skin	Unknown	Unknown	Desert of Suez	<1871			
SMNS	Egg	76113	Heuglin	Damiette	12.4.1861	68.6 (2.70)	55.4 (2.18)	10.7
SMNS	Egg	76113	Heuglin	Damiette	12.4.1861	71.0 (2.79)	56.8 (2.24)	14.3
NHM	Egg	2009.2.1	Finch-Hatton	L. Menzaleh	11.1.1873	72.1 (2.84)	58.4 (2.29)	14.7
Schönwetter (1960–92) mean egg dimensions						74.7	57.1	14.0
Schönwetter (1960–92) minimum egg dimensions						66.0	53.0	11.35

This match between the published account (Heuglin 1869) and the label suggests that the SMNS eggs were obtained but not collected by Heuglin himself (other specimens in the Warthausen collection suggest he was near Sakkara at the time). Furthermore, the single measurement given for the two eggs matches the smaller of the two eggs held at the SMNS exactly. Heuglin (1869) also contains a colour reproduction of one of the *H. albicilla* eggs, which despite some 'artistic licence' is similar to the larger SMNS egg in pattern at the pointed, but not the blunt end. Despite Heuglin's detailed description, Shelley (1871) doubted the breeding of *H. albicilla* in Egypt. In contrast, Gurney (1871) drew attention to Heuglin's account, as well as noting an immature specimen from the 'Desert of Suez', Egypt, in the Museum of the Jardin des Plantes, Paris.

The third egg (Fig. 3), held in Tring, has no accompanying label or other written documentation, but is legibly inscribed '*Haliaeetus albicilla*, Lake Menzaleh [*sic*], 11 Jan 1873'. No further information as to the collector is recorded, but there is strong circumstantial evidence implicating Finch-Hatton. Meinertzhagen (1930) quoted, but gave no date for, correspondence between Finch-Hatton and the well-known British ornithologist, Howard Saunders (1835–1907) describing *H. albicilla* breeding in Egypt: ' . . . several nests of this species were found upon the ground in the reedy marshes of Lake Menzaleh [*sic*], and two adults were shot'. Saunders (1889) gave further details of nests found by Finch-Hatton: 'One found by the Hon. Murray Finch-Hatton (now Lord Winchilsea) in the marshes of Lower Egypt, resembled a gigantic nest of the Marsh-Harrier [*Circus aeruginosus*], being raised to a considerable height above the deep mud by which it was surrounded. Eggs, usually 2 in number, dull white in colour, and measuring about 2′85 by 2′2 in., are laid in Scotland in April; but as early as February or March in the southeast of Europe, and January in Egypt'.

Saunders' account is significant for two reasons: firstly, he specifically mentioned Egyptian *H. albicilla* breeding in January rather than April; secondly, the measurements he quoted are very close to those of the NHM egg (Table 1). This suggests that Saunders may well have known details of or possessed the NHM egg at some point. Moreover, although the exact timing and details of Finch-Hatton's Egyptian visit are uncertain, it is clear that he was in Egypt at the time the egg was collected, as Chennells (1893) included reference

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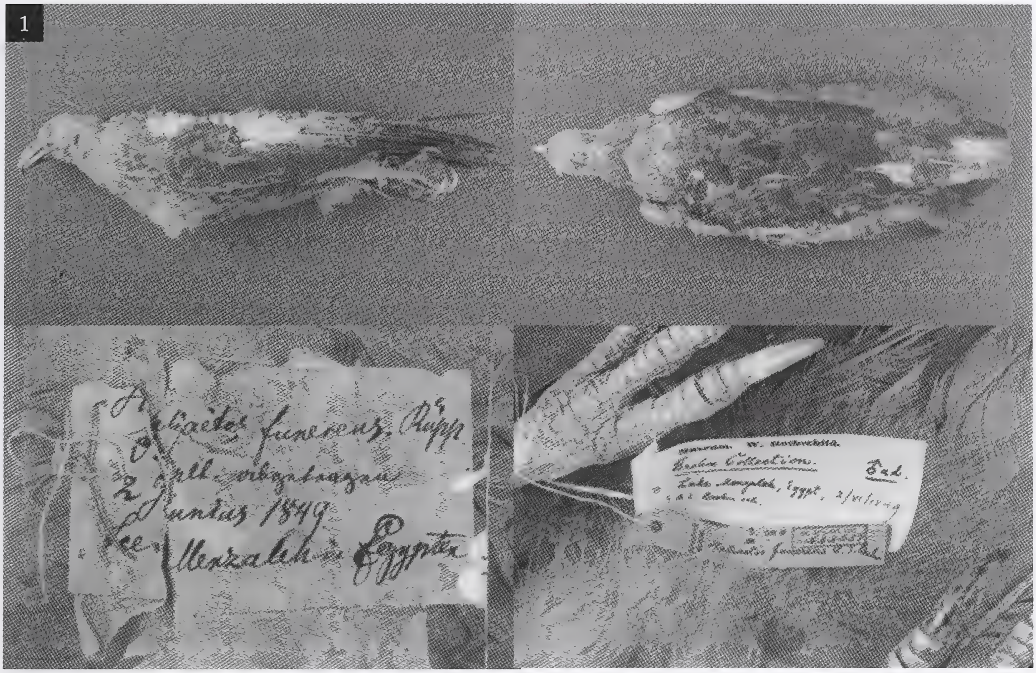
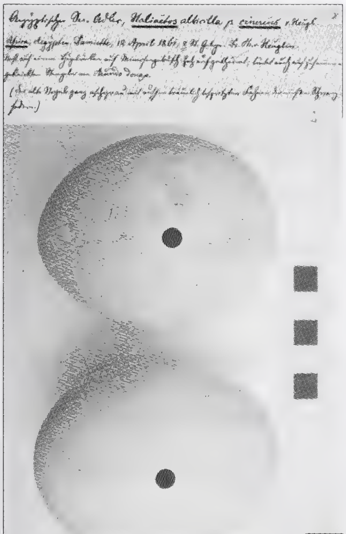


Figure 1. AMNH 535537, holotype of *Haliaeetus funereus*, from Lake Menzaleh [*sic*], Egypt, 2 June 1849. Top left and right: the same specimen in lateral and dorsal views. White tail-feathers but grey back eliminate both Pallas's *H. leucoryphus* and African Fish Eagles *H. vocifer*. Original label (bottom left) states that the plumage was worn on collection. Bottom right, AMNH label (Matt Shanley, © American Museum of Natural History, New York)



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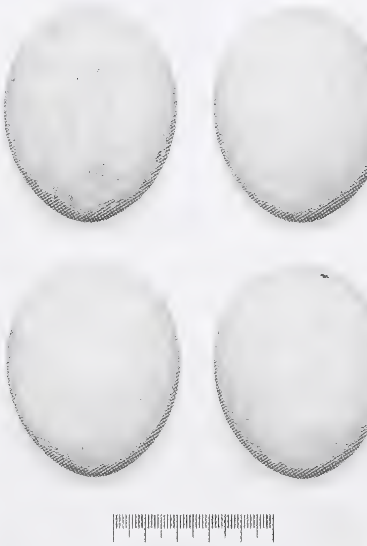

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Figure 2. SMNS 76113, *Haliaeetus albicilla*, Damiette, Egypt, 12 April 1861. Presumed clutch of two and accompanying handwritten label; size bar in mm (Friederike Woog, © Staatliches Museum für Naturkunde, Stuttgart)

Figure 3. BMNH E/2009.2.1, *Haliaeetus albicilla*, Lake Menzaleh [*sic*], Egypt, 11 January 1873 (four 90° rotations of the single egg on its polar axis); size bar in mm (Harry Taylor, © The Natural History Museum, Tring)

to his return from a voyage up the Nile to Shepheard's Hotel, Cairo, circa March 1873. Finch-Hatton was also well known for his 'eclectic pastimes' which included 'climbing (often up cliffs in pursuit of eagles' eggs, which he collected)' (Readman 2006). Although circumstantial, we propose it is likely that he collected the NHM egg during this trip, later corresponding with Howard Saunders on the subject.

The NHM has no record of receiving an egg collection from Finch-Hatton, but did receive portions of Howard Saunders's collection both directly and via other collectors who obtained material from his collection, notably Henry Seebohm (1832–95) and the Revd. Francis Jourdain (1865–1940). In conclusion, the NHM egg was possibly collected by Finch-Hatton, later passed to Howard Saunders and came either directly to the NHM or indirectly with the Jourdain or Seebohm collections.

No further eggs or skins (Table 1) appear to have been taken after 1873, which thus marks the last confirmed breeding in Egypt. Meinertzhagen (1930) noted that the eagles no longer bred at Manzala. The reasons for the population's disappearance remain uncertain. It is clear, however, that Lake Manzala, and its environs, experienced dramatic localised changes in the late 1800s: e.g. the establishment of Port Saïd, the building and opening of the Suez Canal in 1869, changes in agriculture, increasing commerce and early tourism all had significant effects on the flora and fauna of the area. Ebers (1878) noted: 'It is towards the north, in the vicinity of the lake of Menzaleh [*sic*], that the nature of the land seems to have undergone the most conspicuous change. Where formerly the Semitic herdsman could pasture innumerable cattle on the rich marshy land lie pools of bitter, brackish water'.

We compared the eggs described with those collected from more temperate populations. Visually none of the three eggs differs from those of other White-tailed Eagles (Table 1). Equal-variance *t*-tests comparing the mean length, width and weight of the Egyptian population to the published average for *H. albicilla* eggs (Schönwetter 1960–92) were also non-significant ($t_2 = -2.00$, $p = 0.18$; $t_2 = -0.14$, $p = 0.91$; $t_2 = -0.30$, $p = 0.79$, respectively). The eggs also fall within the size range of eggs laid by two other *Haliaeetus* species reported as vagrants from Egypt, African Fish Eagle *H. vocifer* (Goodman & Meininger 1989) and, doubtfully, Pallas's Fish Eagle *H. leucoryphus* (Meinertzhagen 1930, Schönwetter 1960–92). The description of the *Mimosa* bush nest site bears resemblance to typical nesting sites of the Lappet-faced Vulture *Torgos tracheliotus*, but its eggs exceed in length those described here by at least 1 cm (Schönwetter 1960–92).

Discussion

The eggs described here corroborate the existence of a breeding population of *H. albicilla* in Egypt in the mid 1800s. This population represented one of only two breeding populations of the species in Africa and was at the southernmost limit of the White-tailed Eagle's range (Cramp & Simmons 1980, BirdLife International 2009). Other breeding attempts almost as far south have been reported for Algeria, Israel Syria, northern Iran and central Iraq, all of which populations are now believed extinct, except that in northern Iran (Evans 1994, Shirihai 1996, Isenmann & Moali 2000, Murdoch & Betton 2009). All three eggs were collected near Damietta at Lake Manzala (31°27′N, 31°50′E), and the spread of years of specimen collection, from the lectotype of *H. funereus* in 1849 (Hartert 1918) to the eggs in 1861 and 1873, suggests that White-tailed Eagles inhabited Lake Manzala continuously and were not just sporadic breeders as they were elsewhere in the south of their range, e.g. in Israel (Cramp & Simmons 1980). This period also stretches beyond the 20 years of known maximum age of *H. albicilla* (Cramp & Simmons 1980) further supporting the idea of an established breeding population at Lake Manzala.

The Egyptian *H. albicilla* eggs held at NHM and SMNS provide an opportunity to investigate the biology of this extinct population of White-tailed Eagles. Detailed study of the egg shells might reveal adaptations in pore density or shell thickness that could help to regulate water loss (Ar *et al.* 1974) in the hot climate of Lake Manzala, which differs from the cooler conditions of the eagle's core range (Cramp & Simmons 1980). However, we found no immediately obvious difference in size or appearance between the eggs described here and those of more northern populations. In addition, invasive techniques such as genetic sampling of the eggshell membrane (Lee & Prŷs-Jones 2008) might help clarify the taxonomic status of the Egyptian White-tailed Eagles. Similarly, stable isotope analysis of shell membranes (Oppel *et al.* 2009) could assist in clarifying their taxonomic status and reveal whether they relied more on fish or waterbirds as food sources during egg laying.

The descriptions of the Egyptian White-tailed Eagles and the data accompanying the eggs highlight two aspects of breeding biology in particular that set apart these populations from their northern conspecifics, regardless of taxonomic status: (1) an unusual choice of nest site and (2) an extended laying period of at least 6–7 months. Egyptian White-tailed Eagles at Manzala did not use the typically preferred nest sites of the species such as steep slopes, cliffs or trees (Cramp & Simmons 1980), but used low bushes or reed nests instead. In most extant populations of White-tailed Eagle, except Iceland, ground nesting is atypical, and occurs usually on islets or a small rocky island or skerry (Cramp & Simmons 1980); to our knowledge, nesting in reeds is unknown in extant populations. The slightly smaller Pallas's Fish Eagle, in contrast, regularly nests in reedbeds (Cramp & Simmons 1980).

The eggs of White-tailed Eagle are similar in size and appearance to those of African and Pallas's Fish Eagles. Nonetheless, it seems unlikely that the specimens described here are eggs of either species. While the nest type might suggest Pallas's Fish Eagle, this species has been recorded as a vagrant to Egypt only once (Meinertzhagen 1930) and the sight record is considered doubtful (Goodman & Meininger 1989). Furthermore, Heuglin (1869) describes the *Haliaeetus* of Egypt as having white tail-feathers, lacking the distinctive black terminal band of Pallas's Fish Eagle, and the extant specimen clearly is *Haliaeetus albicilla* (P. R. Sweet pers. comm.). African Fish Eagle, too, is only a straggler to Egypt (Goodman & Meininger 1989) and Heuglin would surely have reported the presence of this very vocal eagle at Lake Manzala, as he was familiar with the species from the Blue and White Niles (Heuglin 1869).

The laying period of the Egyptian White-tailed Eagles seems to have extended over most of the autumn to spring (October–April). The letter from Finch-Hatton quoted by Meinertzhagen (1930) states that young were close to fledging in January. Assuming 38 days incubation and then 70 days until fledging (Cramp & Simmons 1980), laying would have occurred in October. The egg recently discovered at NHM was collected in January and probably freshly laid, judging by the two very small blowholes (Scharlemann 2001). Heuglin's eggs in SMNS were also 'hardly incubated' but were collected in mid April. In all extant populations the laying period is clearly more restricted, e.g. in Norway, Iceland, northern Russia and Sweden, eggs are laid late March and early April, with repeat laying to early May. In Germany, eggs are laid late February to April. In southern Europe and Russia the first eggs are laid in late January (Cramp & Simmons 1980).

The *H. albicilla* eggs from the now extinct Egyptian population and their associated data highlight interesting differences from the typical breeding biology of White-tailed Eagle and illustrate the species' ability to adapt to a much wider variety of environmental conditions than currently recognised. In addition, the shells themselves can potentially provide an insight into the population's biology.

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On the status of Isabelline *Lanius isabellinus*, Turkestan *L. phoenicuroides* and Red-backed Shrikes *L. collurio* in the Eastern Province of Saudi Arabia

by Brian S. Meadows

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Summary.—Two races of Isabelline Shrike *Lanius isabellinus* have recently been given specific rank: *L. isabellinus* (Isabelline Shrike) and *L. phoenicuroides* (Turkestan Shrike). Both were formerly considered conspecific with Red-backed Shrike *L. collurio*. This note represents a preliminary analysis of their status at Jubail on the Persian Gulf, based on counts of the three species over a ten-year period. The data indicate that *L. isabellinus* is the main wintering species, being significantly attracted to recently landscaped areas; it is also an early-spring and late-autumn migrant. *L. phoenicuroides* is a later spring and an early-autumn migrant, while *L. collurio* is always most abundant in spring.

Three closely related species of shrikes, Isabelline *Lanius isabellinus*, Turkestan *L. phoenicuroides* and Red-backed Shrikes *L. collurio*, are all regular visitors to the Arabian Peninsula, either as passage migrants or winter residents. However, information on their seasonal occurrence, preferred wintering habitat, numbers and overlap in occurrence on migration is still only partially availble. This is partly because all three were, until relatively recently, considered a single species and identification criteria for their separation—particularly for Isabelline Shrikes—is complex and has often been contentious. This note provides some additional information on their status in eastern Arabia—I follow Panov (2009) who argued the case for splitting Isabelline Shrike into two species (not three, *contra* Pearson 2000); these are *L. phoenicuroides*, which breeds in Central Asia and is considered monotypic, and all of the paler birds breeding in Mongolia and north-west China which are lumped together as *L. isabellinus*.

Background

I was resident in Saudi Arabia during the period 1983–2004 inclusive. The first ten years on the Red Sea at a new industrial city, Yanbu al-Sinaiyah (23°56′N, 38°14′E), were followed by the same period in a similar city on the Persian Gulf at Jubail al-Sinaiyah (27°01′N, 49°40′E). Both sites have been described by the Royal Commission for Jubail and Yanbu (1987). At Yanbu, Baldwin & Meadows (1988) did not attempt to systematically record the two species of isabelline shrikes, which were then considered only as races. However, during the ten years I was resident at Jubail I took field notes on all shrikes encountered and the following is a preliminary analysis of some of my findings. *L. isabellinus* is the sole wintering species and a passage migrant in small numbers in both spring and autumn, *L. phoenicuroides* is a relatively abundant passage migrant at both seasons, and *L. collurio* is almost exclusively a spring passage migrant.

Identification criteria, methods and wintering habitat

During each week I was resident in Jubail al-Sinaiyah I toured the city, which covers an area of *c.*920 km^2, and searched for 'red-tailed' shrikes in suitable habitat, such as areas of shrubs and trees with significant adjacent ground cover, and recorded where birds were present. Observations were made on a daily basis but of over 20 potential sites only a few could be visited every day, although all were inspected at least once per week. Approximately 10% of the city had been established by 1994, in line with a master plan, but much of the city outside of the industrial parks and settlement zone was still completely undeveloped. Natural habitat in the form of barchan sand dunes, some *Stipa* steppe along the western boundary and a mix of low coastal dunes and salt-pans in the east remained throughout my residency. Not one working palm oasis, which are known to attract overwintering shrikes elsewhere in the Eastern Province, however, remained within the city boundaries and much of the natural habitat was of little attraction to shrikes except during exceptional 'falls' of migrants.

Recently landscaped areas provided the majority (bar two) of the overwintering sites: a total of 15 man-made sites held shrikes in December–February and nine of these were occupied during three or more winters in 1994–2004. Optimal man-made habitat consisted of a mosaic of dense shrubs and small trees adjacent to irrigated grass lawns and flower beds with bare soil—mimicking natural shrike habitat. Such areas had been developed for coastal landscaping (there is now an 8-km corniche along the coast), small parks, mosque grounds plus gardens around offices within industrial parks and at a hotel. It was noticed that at one regular overwintering site, when an adjacent grass lawn was replaced with gravel, the shrikes left. Tall vegetation growing in and around land-treatment areas from septic tanks on temporary housing estates lacking main drainage were also used in successive years. Of two natural overwintering sites identified, one comprised vegetation surrounding a surface pool fed by late-autumn rains in the hollow of a large sand-dune, and the second *Tamarisk*-dominated scrub surrounding a groundwater-fed pool at the base of a coral outcrop on the coast. Some wintering birds always remained well hidden within bushes from where they pounced on their prey—unlike grey shrikes *L. meridionalis* / *L. pallidirostris*, which normally used exposed perches atop bushes as lookouts—and because of this behaviour it was easy to under-estimate the numbers of wintering *L. isabellinus* without repeat visits / long periods of observation. In addition, similar landscaped habitat in coastal Saudi Arabia between Jubail and Al-Khobar (26°17′N, 50°12′E) was also attractive to overwintering *L. isabellinus*, albeit with significant differences in numbers during different winters as at Jubail. Highest densities of wintering birds were often found in the garden on the Saudi Arabia–Bahrain causeway (e.g. at least ten on 25 December 2002).

As indicated above all the overwintering shrikes were considered to be *L. isabellinus*. Identification in the field, however, can be extremely difficult due to overlap in features, while published descriptions rarely take into account different perceptions of colour between observers. Ideally, all birds should be mist-netted for feather analysis, but this was impossible because of security concerns, especially as many were in public places. The best consistent features I found for separating adult *L. isabellinus* from *L. phoenicuroides* were the paler upperparts (including crown to lower back)—resulting in less contrast between the upper- and underparts, much less-contrasting facial features with an inconspicuous white supercilium and a relatively indistinct narrow dark eye-mask, normally confined to behind the eye, and a much duller red (considered cinnamon) rump and tail (the latter possibly shorter on many birds); all of the latter features combine to give an overall pallid appearance. Variation in the size of the white wing-patch was found to be of limited value for specific identification in the field. All obvious hybrids and birds that I could not assign to species (some of which were probably birds of the '*karelini*' type) have been excluded from Table 1. It is possible, however, that a few individuals were misidentified, but this is unlikely to affect my general conclusions concerning wintering status and passage periods of the two species at Jubail. No attempt to identify races of *L. isabellinus* was made, although most were probably of the nominate form. Separation of *L. collurio* from *L. isabellinus* and *L. phoenicuroides* was relatively straightforward using modern field guides. Optical aids were normally limited to 10× binoculars but on the Arabian Peninsula, compared to temperate latitudes, light conditions were usually excellent.

Migration

Data on migration periods, for the purpose of this account, covers March–May and September–November (Table 1). Table 1 shows the total number of birds found at Jubail al-Sinaiyah; each month has been divided into early (1–15, inclusive) and later periods, plus the number of bird days. The data cover the autumn of 1994 to the end of spring in 2004 (with the exception—in 1998—of the second half of September and first 15 days of October). It is recognised that using these criteria for migration data, for early March and late November, in particular, there is likely to be some overlap between wintering individuals and migrants, especially for *L. isabellinus*, while in some years passage can even continue until early December (e.g. a 'fall' of five *L. isabellinus* in a reedswamp surrounded by desert on 6 December 2002—left by 9 December—in a year when there had been negligible passage earlier). March departure dates in different years also varied by up to 22 days, based on sightings of individually recognisable birds that were known to have overwintered in the city (these have been excluded from Table 1).

Discussion

My observations show that *L. isabellinus* is the only species that overwinters, which conclusion was also made by Hirschfeld (1995) on Bahrain, albeit he had no data on the situation in Saudi Arabia at the time. However, this was also probably the case, in retrospect, of the three birds reported overwintering on the Red Sea coast (Baldwin & Meadows 1989). Migrants of this species arrive later and pass through earlier than *L. phoenicuroides*, with relatively few remaining into April and none apparently occurring until October (Table 1). *L. phoenicuroides* passes through mainly from the second half of March until early May and

TABLE 1

Occurrence of Isabelline *Lanius isabellinus*, Turkestan *L. phoenicuroides* and Red-backed Shrikes *L. collurio* at Jubail, Eastern Province, Saudi Arabia, with each month 'divided' into two halves.

	L. isabellinus		*L. phoenicuroides*		*L. collurio*	
	First	Second	First	Second	First	Second
March	49/49	27/34	16/8	83/43	0/0	0/0
April	10/9	0/0	56/35	89/57	0/0	341/99
May	0/0	0/0	35/26	3/3	653/99	142/47
September	0/0	0/0	52/38	113/49	0/0	2/2
October	4/4	40/32	48/29	28/19	0/0	0/0
November	27/29	34/34	19/10	4/3	0/0	0/0

TABLE 2

Occurrence of Red-backed Shrikes *Lanius collurio* at Yanbu (1984–92)

	Bird days	No. of birds
Spring (March–May)	6	6
Autumn (August–October)	113	262

Years recorded: spring 3/9, autumn 9/9.

again from late August with a peak usually in September. In addition, mention can be made of two individuals seen in July (6–17 July 1994 and 17 July 2003) which were considered to be local breeders that had dispersed—the species breeds on the opposite side of the Persian Gulf (Porter *et al*. 1966) and has bred at least once in Arabia (Eriksen & Jennings 2006). *L. phoenicuroides* winters much further south than *L. isabellinus*, some individuals regularly reaching as far south as north-east Tanzania (Lefranc & Worfolk 1997). Britton (1980) stated that the species frequents dry woodland, bushland, scrub and cultivation from sea level to *c*.2,000 m; in central Kenya, where I lived prior to taking up residence in Saudi Arabia, I found that they often overwintered in verdant riverine habitat—far less arid than many natural habitats utilised by *L. isabellinus*, but apparently still in drier country than *L. collurio* wintering even further south in Africa.

L. collurio passes through Jubail mainly during the first two weeks of May with the vanguard from mid April; in 1996 there was a very heavy fall in late April. In some years, stragglers (usually) females are still passing through in June (latest 23 June 2004). The peak in May coincided with the appearance of large numbers of other spring migrants, especially Common Whitethroats *Sylvia communis*, which are frequently killed by shrikes. There were no July records. In autumn it is scarce, with only two records (both in September 2002) during ten years' residence in Eastern Province. This is in complete contrast to my experience at Yanbu al-Sinaiyah, where the species is rare in spring (Table 2). In spring most probably enter Arabia via the south-west of the peninsula in association with a rain belt, which is prevalent at this season, between the Gulf of Aden and along the Red Sea coast as far north as 20°N. It is, however, an annual migrant in autumn. The presumed earliest-returning bird at Yanbu was on 24 July 1992 (an immature that stayed until 10 August) but with maturing landscaped areas the possibility of occasional breeding within the city, as is already the case for some other Palearctic summer migrants at Yanbu, cannot be ruled out in the future. In spring, the results at Jubail, and its known scarcity along the northern Red Sea coast as a spring migrant, indicate that any individuals arriving on the Persian Gulf heading for Western Europe via the Levant would migrate almost due west after departing. A bird ringed in the Czech Republic in June was recovered the following May in the Eastern Province (Hirschfeld 1995). It is, however, not known what percentage of the birds seen at Jubail was heading for Western Europe or the Near East, *vis-à-vis* those migrating to Central Asia, as subspecific identification of *L. collurio* was not attempted.

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The identity and sources of *Palaeornis anthopeplus* Lear, 1831, and *P. melanura* Lear, 1832 (Regent Parrot), and their neotypification

by Richard Schodde

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Summary.—Evidence from morphology and historical exploration is combined to show that the now-lost type material of the two senior specific names for the Australian Regent Parrot, *anthopeplus* Lear, 1831, and *melanura* Lear, 1832, originally came from south-west Australia. This finding answers 20th century dispute over the type locality, and supports neotypification that had been designated to settle the names on the south-western subspecies.

Endemic to Australia, the brilliant mustard-yellow Regent Parrot *Polytelis anthopeplus* (Lear, 1831), occurs in two widely separated isolates in the south-west and inland south-east of the continent. It was named *Palaeornis anthopeplus* by Edward Lear from a single figure in feminine plumage in pt. 8, October 1831, of his (1830–32) *Illustrations of the family of Psittacidae, or parrots*. In that work he later published another single figure of the much brighter, black-tailed adult male as a different species, *Palaeornis melanura* (pt. 12, 1832). Neither figure was accompanied by a reference to its geographic source, nor a designation as type; and the individual specimens on which the plates were based are currently presumed lost (Schodde 1993). Until a review of geographic variation (Schodde 1993), differences between eastern and western isolates had attracted little attention. Peters (1937) and Forshaw (1969, 1974) recognised none. Later, when Forshaw (1981: 158) accepted the isolates as separate subspecies, following Mathews (1915) and Condon (1975), he did so with stated reluctance.

When separating the isolates, Mathews (1915) described the western as new (*westralis*) because he had previously 'restricted' the type locality of both *anthopeplus* and *melanura* to 'New South Wales' in the east (Mathews 1912a). Even though made arbitrarily and without explanation, this restriction was accepted unquestioningly until 1993. The procedure nevertheless is not recognised by the *International code of zoological nomenclature*, hereafter 'the Code' (ICZN 1985, 1999), and is to be corrected if shown to be 'erroneous' (Recommendations 72H (b) and 76A.2 respectively). This was the course that I took in my revision of the Regent Parrot in 1993, concluding from the tones of Lear's figures of *anthopeplus* and *melanura* and historical circumstances, that the types of these names came from south-west Australia, not the east (Schodde 1993). Accordingly, neotypes were designated to establish the point; and the eastern isolate, un-named as a consequence, was described as the new subspecies, *monarchoides*. *Prima facie* grounds for neotypification under Art. 75 of the Code (ICZN 1985, 1999) were the loss of original type material and the conflicting type localities for *anthopeplus* and *melanura* which confuse application of the names. Exacerbating that confusion, Mees (2004) then defended Mathews' designation of 'New South Wales' as the type locality for *anthopeplus*, arguing that I had shifted it to south-west Australia on insufficient grounds and erred by designating neotypes illegally. Thus the purpose of this paper is to establish as far as possible the identity and source of the material in Lear's original figures. To do this I have compared further specimen material with information in original literature and the facts of early exploration in Australia.

The issue hinges on evidence for the type locality of *anthopeplus* and *melanura*. Using only secondary references, Mees (2004) challenged my conclusions (Schodde 1993) on the following grounds: (i) Mathews (1912a, 1915) found that Lear's plate of *anthopeplus* 'did not show subspecific characters either way', (ii) I agreed with this view, and (iii) I conceded that early, pre-1832 'specimens from *eastern* Australia (italics mine) could have been received (by Lear) through trade channels, such as the famous firm Leadbeater'. Here Mees misread both Mathews' and my accounts. I can find no evidence that Mathews ever commented on the subspecific identity of Lear's figures of *anthopeplus* and *melanura*; certainly there is nothing in any of the references mentioned by Mees. Nor did I agree with Mathews on the characters of Lear's plate of *anthopeplus*: Mathews never published on the subject. As for the supposition that material of Regent Parrots could have reached Lear from eastern Australia, this too I neither stated nor implied. More crucially, Mees clouded the issue by misreading his quotation from my study (Schodde 1993). I wrote: 'Lear's (1830–2) superb figures of *Palaeornis anthopeplus* and *P. melanura*, nevertheless, also match the western form'. Here Mees took the word 'also' to imply that Lear's figures agreed with the eastern as well, whereas its context in the paragraph does quite the opposite, reinforcing instead the point that the figures match the western form alone.

The fact is that Mathews' (1912a) restriction of the type localities of *anthopeplus* and *melanura*, made in his first sketchy and unreferenced listing of type localities for Australian birds, itself undermines the case for 'New South Wales'. Mathews rarely concerned himself deeply with tracking down type localities for pre-Gouldian names, routinely restricting them to 'New South Wales': that was the region where British colonisation of Australia began and the source of most Australian specimens in the first decades of the 19th century. In the case of *anthopeplus* and *melanura*, moreover, he was constrained by a lapse, recording the geographic range of the Regent Parrot as 'New South Wales, Victoria, South Australia' and omitting south-west Australia (Mathews 1912a). Thus the assigned type locality 'New South Wales' for these names was not based on rational choice between south-west and south-east Australia, but on a faulty *ad hoc* notion of species distribution. Even as a guess it was flawed.

Real evidence for the geographic origin of Lear's material of *anthopeplus* and *melanura* comes from three sources. One is the identity of the figures in Lear's plates. Collections not previously available to me from south-west Australia (*n*=14 ♂♂, 6 ♀♀ in the American Museum of Natural History and Australian National Wildlife Collection), including fresh adult female material, reveal that one of the most trenchant morphological differences between western and eastern isolates is the body tone of feminine plumage. It is a difference so far little stressed in literature. Western females and immatures are mid olive-green often but not always washed with a dulling grey, whereas eastern females and immatures are much brighter citrine-green with a distinct yellowish cast, particularly on the face and rump /uppertail-coverts. Even though shown only side-on, the tones of these areas of plumage in Lear's plate of *anthopeplus* are clearly greenish and greyish olive respectively. Adult western males are similarly, though less markedly, duller than the bright mustard of yellow eastern males, the dusky olive tone of their backs often washing well up onto the head. The sexual difference in body tone between adult males and females / immatures, moreover, is noticeably greater in south-west Australia. With the same yellow cast, eastern females and immatures are merely duller than adult males, whereas western females and immatures are much greener than their males. Here, despite his tendency to brighten colours in the birds he painted, Lear's life-like figures of both *anthopeplus* and *melanura* match the plumage tones and sex / age contrasts of the western, *not* eastern form, corroborating my earlier assessment (Schodde 1993, 1997).

The second piece of evidence comes from the circumstances of early ornithological exploration in Australia up to 1831–32 when *anthopeplus* and *melanura* were described (Mathews 1912b). By then, the range of the Regent Parrot in the south-west had been penetrated by the garrisoning of King George Sound (Albany) from 1826 and settlement along the Swan River in 1829–31 (*The encyclopaedia of Australia* 1983: Western Australia). There Regent Parrots were found by John Gilbert only a decade later (Gould 1845). It is from these sources that Lear got material for his folio of other south-west Australian parrots: *Calyptorhynchus baudinii* Lear, *Platycercus stanleyii* Vigors = *P. icterotis icterotis* (Kuhl), *Platycercus pileatus* Vigors = *Purpureicephalus spurius* (Kuhl) and *Platycercus baueri* Lear = *Barnardius zonarius semitorquatus* (Kuhl). In contrast, the range of the eastern Regent Parrot in the inland Murray mallee was, with the exception of a single venture, ornithological *terra incognita* until 1836 when Surveyor-General Thomas Mitchell reached the junction of the Murray and Darling Rivers (*The encyclopaedia of Australia* 1983: Exploration by Land). Earlier access was simply not possible. At 800 km from Sydney, 500 km from Melbourne and *c.*200 km from Adelaide, this region could only be approached at that time by large, well-equipped expeditions supplied from those centres. Melbourne, apart from failed and under-resourced penal settlements at Sorrento in 1803–04 and Western Port in 1826–28, was not established until 1835 (*The encyclopaedia of Australia* 1983: Victoria). Adelaide only followed a year later. And, until Mitchell's expedition, Sydney was too far away, across not only the Blue Mountains but also the inhospitable Hay Plains.

The single exceptional venture was Charles Sturt's voyage down the Murrumbidgee and Murray rivers in 1830. By remarkable coincidence, Sturt did collect Regent Parrots, as I reported (Schodde 1993), preparing as skins a pair of 'Yellow King Parrots' out of a dozen or so shot (Sturt 1834, pl. opp. p. 191, Stenhouse 1830). Yet, whereas material from Sturt's more northerly expedition to the upper Darling River a year before could have reached London, including perhaps the type of *Cacatua leadbeateri* (Vigors), the skins from the Murray-Murrumbidgee expedition were passed to Sturt's commanding officer in Sydney, Lt.-Colonel Patrick Lindsay; and Lindsay sent them directly to Robert Jameson, professor of natural history at the University Museum in Edinburgh in late 1830 (Stenhouse 1830, Whittell 1954: 97). One specimen, the female, still survives. Lear, who then worked in London on material from the Australian colonies provided instead by the Zoological Society of London at Regent's Park, Lord Stanley, N. A. Vigors, and the natural history dealers B. & J. Leadbeater (Hyman 1980: 20–22, Tree 1991: 38), would not have seen them; he apparently never visited Edinburgh, and certainly not before the end of 1832. Thus, in the absence of connection between Sturt's specimens and Lear's lost material of *anthopeplus* and *melanura*, the source of the latter can only be south-west Australia.

The third piece of evidence comes from the discovery of the *possible* holotype of *Palaeornis anthopeplus* Lear in the World Museum, Liverpool. It is labelled as a female, WML no. 3577, in the collection of Lord Stanley, 13th Earl of Derby, from the London traders B. & J. Leadbeater, but it lacks further data (C. T. Fisher pers. comm.). Lear had access to Stanley's collections for his work on parrots (Tree 1991: 49). Yet however likely it is that this was the specimen of *anthopeplus* illustrated by him, there is no explicit reference to Lear on its label or in the World Museum register. Nor is there clear evidence that this specimen was in Lord Stanley's or the Leadbeaters' possession by mid 1831 when Lear painted *anthopeplus* (C. T. Fisher pers. comm.). Even so, the skin has wings and tail worn in the way of a captive live bird, the very subject that Lear preferred to illustrate, and it bears several remarkable similarities to the original figure of *anthopeplus*: (i) the same shoulder pattern with extensively hidden pale green wing-coverts and broad blue-black outer margining, (ii) the same dull rump, and (iii) the same wash of green across forehead and face contrasting with a quite dusky olive back. Its tail, though shorter, has evidently been broken, leaving its moderately demarcated dark greyish-olive breast as the only anomaly. Although the specimen is unprovenanced, its generally olive body tone and dull rump identify it with the south-west Australian form. This is further evidence that, whether type material or not, specimens of Regent Parrots available in London around Lear's time came from that region. Even the female figured 14 years later by Gould (1845) in his *The birds of Australia* is visibly of the south-western form, no doubt collected by John Gilbert. The British Museum of Natural History in London did receive early material of the eastern form from Charles Sturt and Sir George Grey, but not until the early–mid 1840s from their periods as respective Assistant Commissioner of Lands (Surveys) and Governor in South Australia (*cf.* Salvadori 1891: 480).

So comprehensive is the combined evidence for a south-west Australian source for Lear's material that one could well ask whether there is any point to neotypification. Yet, without firm evidence that WML 3577 in Liverpool is original type material, a *prima facie* case still exists for neotypification of both *Palaeornis anthopeplus* Lear and *P. melanura* Lear under the Code (ICZN 1999). It is a case strengthened by Mees' (2004) challenge. Had the type localities of *anthopeplus* and *melanura* been shifted to south-west Australia on more questionable grounds, his charges would have substance. But as the grounds are circumstantially sound, the charges lose force. Thus neotypification is the outcome of work that was, as Mees (2004) himself admitted, revisory, which supercedes Mees' claim that the designation was illegal, made as an end in itself (Art. 75.2). It also satisfies the critical conditions of Art. 75.3.1, namely, that its express purpose is to resolve complex and contradictory problems by clarifying the taxonomic status or type locality of nominal taxa. Even the most casual reader will appreciate that this requirement is met due to the dispute over type localities. As for the issue of stability raised by Mees (2004), it can be well argued that eastern and western subspecies of the Regent Parrot were recognised so infrequently and with such little confidence until 1993 that neotypification reflecting the realities of type source then outweighed any drawbacks from shifting the name *anthopeplus* from eastern to western isolates. This view has since gained widespread acceptance, the shift having been adopted widely in international (Collar 1997, Juniper & Parr 1998, Dickinson 2003) as well as national Australian (Schodde 1997, Higgins 1999, Forshaw 2002, Sindel & Gill 2003) literature. Today usage is such that reverting to pre-neotypification nomenclature based on the old erroneous type localities of Mathews would have the very destabilising effect that the Code seeks to avoid.

Until WML 3577 can be confirmed as original type material, neotypification of *Palaeornis anthopeplus* Lear and *P. melanura* Lear (Schodde 1993) should continue to stand because: (i) it fulfills all qualifying conditions required for neotypification by both the third (Art. 75 (b) and (d)) and fourth (Art. 75.3) editions of the Code (ICZN 1985, 1999), and (ii) it settles and protects nomenclature now in widespread use. Although, under Art. 86.3 (ICZN 1999), only conditions for neotypification under the current edition of the Code need to be satisfied, I have quoted the equivalent requirements in the previous edition as well because it was that edition under which neotypification was originally effected and later challenged (Mees 2004). If it is subsequently shown that WML 3577 is the holotype of *anthopeplus* Lear, no further name shifting will result because that specimen is of the south-west Australian subspecies.

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White Wagtail *Motacilla alba*, a vagrant to Barbados, Trinidad and French Guiana

by Johan Ingels, Olivier Claessens, Thomas Luglia, Patrick Ingremeau & Martyn Kenefick

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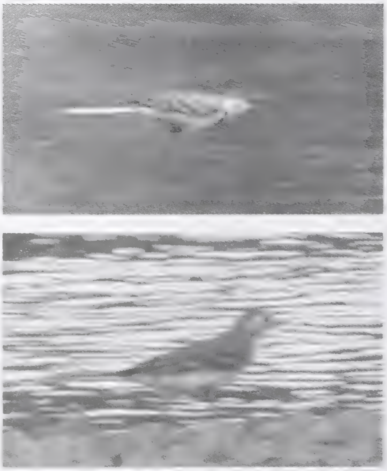
White Wagtail *Motacilla alba* is mainly an Old World species, widely distributed as a breeder from south-east Greenland over the entire Palearctic and south-east Asia to north-west Alaska. In winter its range also extends south to central Africa and southern Asia (Alström & Mild 2003). In North America White Wagtail is represented by two subspecies, *M. a. ocularis* and *M. a. lugens* (Alström & Mild 2003, Tyler 2004). *M. a. ocularis* breeds in westernmost Alaska and has wandered south to California and Baja California in Mexico, whilst *M. a. lugens* occasionally breeds in coastal Alaska and is a rare vagrant south to western North America. Both subspecies have also been recorded in south-east North America, in North Carolina, South Carolina, Florida and Louisiana (Howell & Webb 1995, AOU 1998, Buckley *et al*. 2009). Palearctic *M. a. alba* is also a rare vagrant to Florida (March), Québec (May) and North Carolina (October) (Buckley *et al*. 2009). In early 1987, *M. a. alba* was recorded on Barbados, and at the end of 1987 probably also in Trinidad (ffrench 1991, Kenefick *et al*. 2007, Buckley *et al*. 2009, Oatman in prep.).

We report here one observation substantiated with photographs of a White Wagtail of the subspecies *alba*, and a brief view of another White Wagtail, from French Guiana, the first for this species on the South American continent. We also discuss a recent White Wagtail on Trinidad, together with an overview of earlier records on Barbados and on Trinidad.

Observations in French Guiana

One morning between 10 and 15 September 2009, M. Clément (pers. comm.) saw a White Wagtail in his garden at km 10 along the road to Apatou (*c*.05°25′N, 54°04′W), south of Saint-Laurent-du-Maroni in western French Guiana, and *c*.50 km inland. It flew low over the lawn on leaving the bank of a small pond in the backyard. Its greyish upperparts, whitish underparts, long tail and undulating flight, 1.0–1.5 m above the ground, were unmistakable. However, the observation was not submitted to the French Guiana Rarities Committee (Comité d'Homologation de Guyane, CHG), and therefore could not be evaluated.

On 26 October 2009, TL & PI were travelling with a group of birders on the Approuage River in eastern French Guiana. As they passed Îlet Lézard (*c*.04°09′N, 52°23′W), *c*.90 km inland and *c*.225 km from the site where the wagtail was seen in September, they saw three birds foraging amongst low weeds on a gravelly sandbar in the middle of the river. One was a Spotted Sandpiper *Actitis macularius*, another a White-rumped Sandpiper *Calidris fuscicollis*, but the third was clearly a wagtail—a small, tall-legged passerine, walking with



Figures 1–2. White Wagtail *Motacilla a. alba*, Îlet Lézard, Approuage River, French Guiana, 26 October 2009 (Patrick Ingremeau)

a long wagging tail while bobbing its head. Its grey upperparts, white underparts, two white wingbars and an obvious black breast-band are typical of *M. a. alba*, a form with which most of the observers were familiar in France. Although it proved shy, PI was able to photograph the bird (Figs. 1–2); it was not seen subsequently. The absence of a black eyestripe or a 'white shoulder' eliminates *M. a. ocularis* and *M. a. lugens* respectively, whilst the white flanks and grey rump eliminate *M. a. yarrellii*, which is essentially resident in the British Isles (Alström & Mild 2003). Its uniform greyish forehead, crown, nape and mantle indicated a first-year or an adult in winter plumage, probably a female. It was accepted by the CHG as the first White Wagtail for French Guiana.

Vagrant *Motacilla alba* on Barbados and Trinidad

On 28 January 1987, a first-year or adult male White Wagtail of the nominate race *M. a. alba* was found at Bridgetown Harbour (*c*.13°05′N, 59°37′W) on Barbados (Norton 1987). The combination of plain white face and throat plus a black crown and breast-band eliminated *M. a. lugens* and *M. a. ocularis* (Buckley *et al.* 2009).

On 26 December 1987–2 January 1988, a White Wagtail was seen and photographed at Aripo Agricultural Research Station (*c*.10°38′N, 61°14′W) in northern Trinidad by a group of birders led by F. Oatman. It was not identified to subspecies (ffrench 1991, Kenefick & Hayes 2006, Kenefick *et al.* 2007), but was accepted by the Trinidad & Tobago Rare Bird Committee as the first *M. alba* for South America (Hayes & White 2000), though Kenefick & Hayes (2006) preferred to consider the record as hypothetical. Recently an original photograph turned up and is set to be published (Oatman in prep.).

On 27 September 2009, a group of British birders led by experienced local guide M. Ramlal observed a wagtail at the same agricultural research station where the White Wagtail was seen in 1987–88 (S. J. Tyler pers. comm.). Ramlal had also seen that wagtail, and all observers were familiar with the British subspecies *M. a. yarrellii*. Although they could not identify the subspecies involved, there is no doubt as to its identity as a White Wagtail.

Discussion

As Barbados is usually considered part of North America, the 1987 record on Trinidad was the first for this species in South America (Hayes & White 2000, Oatman in prep.). Although the White Wagtail is not yet included in the main list of the birds of South America, the photograph of the wagtail at the Aripo Agricultural Research Station is mentioned in the South American Classification Committee's 'Hypothetical list' (Remsen *et al.* 2010). The Approuague bird thus constitutes the first confirmed record of White Wagtail for continental South America.

The White Wagtails seen in 1987 on Barbados and in 2009 in French Guiana were identified as *M. a. alba*, which breeds in continental western Europe. Northernmost populations migrate in September and October to their winter quarters in south-west Europe and northern Africa (Alström & Mild 2003). The occurrence of White Wagtails in the southern Lesser Antilles and north-east South America in September–January is consistent with migrants being diverted west by strong north-east trade winds prevailing over the Atlantic Ocean at that season (V. Kousky pers. comm.; Kenefick & Hayes 2006).

The cluster of Trinidad and Guiana records in 2009 is striking in being distributed over a relatively small area, relative to the distances travelled by the birds. Moreover, there is no reason to assume only one individual was involved. Rather, since wagtails usually migrate in small parties, it is more likely that such a party was diverted during migration in autumn

2009 and those individuals then wandered between the southern West Indies and French Guiana.

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The correct type locality of *Cisticola chiniana humilis* Madarász, 1904, with comments concerning the true identity of the collector

by D. A. Turner

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Madarász (1904) described *Cisticola humilis* from two females collected in 'Gebirge Lettema (EA)' on 28 March and 11 April 1904 by 'Koloman Katona'. Lynes (1930) in discussing *C. chiniana humilis* gave the type locality as Settima Mts., Kenya Colony, and in his subsequent list of localities and dates referred to the type of *humilis* as being from the Settima Mts. in Naivasha District. Settima Mts. was retained as the type locality for *humilis* by Friedmann (1937), Jackson & Sclater (1938) and Mackworth-Praed & Grant (1955), all clearly following Lynes (1930) as their authority.

Unfortunately, Lynes had clearly confused 'Gebirge Lettema (EA)' with Settima, a high part of the Aberdare Mts. in central Kenya east of Lake Naivasha. In fact 'Gebirge Lettema (EA)' refers to the Lettema (or Lelatema) Mts. south of Moshi in northern Tanzania. Madarász (1904) gave the name Koloman Katona as the collector of the type specimens, which was none other than Kalman Kittenberger, a Hungarian explorer, hunter, naturalist and collector of natural history specimens for the Hungarian National Museum in Budapest (Prŷs-Jones *et al.* 2008). He undertook two expeditions to German East Africa (later Tanganyika), in 1903–06, largely in the Kilimanjaro–Arusha–Moshi–Lake Jipe area, and from 1908–12, when he explored the area immediately east of Lake Victoria, now known as the Mara-Serengeti region of northern Tanzania. Other than traveling from Mombasa to Voi by train and then on foot to Kilimanjaro in January 1903, Kittenberger spent all his time in German East Africa, though he was in Loliondo District in January 1910 and his type of *Sarothrura affinis antonii* was collected in an area astride the modern Kenya–Tanzanian border. Kittenberger (1958–59), in one of his few papers in English, detailed his East African collecting expeditions, and commented on the name Katona. It appears that during his absence from Hungary the then Director of the National Museum in Budapest, arbitrarily applied instead of his real name, the name 'Katona'. In fact, Kittenberger himself never changed his name; it was only his brothers who 'Magyarized' their name to Katona.

In the same document Kittenberger further confirmed the locality and dates of collection of *C. c. humilis* specimens as the Lettema Mts. on 28 March, 11 April and 28 May 1904. His sketch map clearly shows the position of the type locality (written Letatama Mts.) due south of Moshi. Modern maps of East Africa show this range as the Lelatema Mts., part of which being more widely known as the Merelani Hills, source of the gemstone Tanzanite. In common with the great majority of the specimens Kittenberger collected, all his *C. c. humilis* were deposited in the Hungarian National Museum, where they unfortunately perished in the fire that destroyed the bird collection in 1956 (Prŷs-Jones *et al.* 2008).

The correct type locality of *C. c. humilis* therefore should be the Lelatema Mountains south of Moshi, northern Tanzania, at *c.*03°45′S, 37°20′E, collected by Kalman Kittenberger. This further extends the distribution of *C. c. humilis* from the western and central highlands of Kenya south to the Kilimanjaro–Moshi area of northern Tanzania, where it meets and quite possibly intergrades with *C. c. ukamba*.

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Merops oreobates (Sharpe 1892): a monotypic species or not?

by D. A. Turner

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Prior to Fry's (1969) major contribution on the evolution and systematics of bee-eaters, it had been generally accepted by most authors including Jackson & Sclater (1938), Chapin (1939), Peters (1945), Boetticher (1951) and White (1965) that Cinnamon-chested Bee-eater *Merops oreobates* (Sharpe 1892) is nothing more than a race of *M. lafresnayii* Guérin-Méneville, 1843. However, Grant & Mackworth-Praed (1937) had considered (mainly on morphological grounds) that *lafresnayii* more closely resembles Blue-breasted Bee-eater *M. variegatus* Vieillot, 1817, than *M.l. oreobates*, and had proposed that *lafresnayii* be considered a race of *variegatus*, thereby leaving *M. oreobates* a distinct monotypic species of the East African highlands. This position was subsequently followed by Mackworth-Praed & Grant (1952) but clearly rejected by White (1965). More recently, Fry (1984), Fry *et al.* (1988), Fry (2001) and Dickinson (2003) have all followed Grant & Mackworth-Praed (1937) and Fry (1969) in considering *lafresnayii* a race of *variegatus*.

Throughout the greater part of its range in West, Central and East Africa, *M. variegatus* is a bird of damp lowland grassland and lakeside vegetation (Chapin 1939, Benson *et al.* 1971, Britton 1980, Zimmerman *et al.* 1996, Dowsett *et al.* 2008), but the subspecies *M. v. bangweoloensis* does reach 2,000 m in swampy areas of the Ufipa Plateau, south-west Tanzania (D. Moyer & R. J. Dowsett pers. comm.). This is in direct contrast with *M. oreobates*, which throughout its range is a montane species of open forest, forest edges and woodlands at 1,600–2,300 m (Zimmerman *et al.* 1996). In Ethiopia *lafresnayii* is largely confined to the Rift Valley and adjacent highlands, favouring a variety of forest habitats between 530 m and 1,830 m (Ash & Atkins 2009).

Morphologically, *lafresnayii* is intermediate between *variegatus* and *oreobates*, being closer to the former in coloration, but nearer the latter in size and habitat preference. Vocalisations of *lafresnayii* are reportedly identical to those of *oreobates* but totally unlike *variegatus* (B. Finch pers. comm.). In Chappuis (2000) some vocals of *variegatus* are either a rather hard *klup, klup*, or slightly softer and more prolonged (e.g., a pair displaying), in contrast to the vocals of *oreobates* which are much higher pitched. Van Someren (1922) had commented that specimens of *oreobates* from the Turkwell (Gorge) area of north-west Kenya are sometimes very like Ethiopian birds, having the blue forehead, supercilium and neck-patch. Recent photographs of birds in typical *oreobates* habitat at Malewa River Lodge, at 2,200 m, in the central Rift Valley of Kenya north of Lake Naivasha, and from Kakamega Forest (1,700 m) in western Kenya show birds with a prominent blue supercilium and, in the case of the Malewa bird, a bright violet-blue neck-band.

Fry (1984) posed the question: 'is the large blue-gorgeted bird in the highlands of Ethiopia (*lafresnayii*) conspecific with the large black-gorgeted one in the highlands further south (*oreobates*), or with the small blue-gorgeted one of neighbouring lowlands (*variegatus*)?'. Clearly inclining to the latter view, he felt that the two highland forms were independent derivatives of lowland *M. variegatus*, the Ethiopian population more recently so than the East African form on account of it showing similar characters (colour of forehead, supercilium and neck-band). Nevertheless, Fry (1984) doubted that unanimity would ever be reached on this problem, and that further revision might be necessary in the future.

While it is probable that *oreobates* and *lafresnayii* are independently derived from *variegatus*, with components of *variegatus* appearing in both highland forms (not just *lafresnayii* as earlier thought by Grant & Mackworth-Praed, and Fry), with clear vocal and habitat differences between *variegatus* and the other two, surely *oreobates* can no longer be considered a monotypic species confined to the montane forests of East Africa? With *lafresnayii* having priority, *oreobates* would revert to *Merops lafresnayii oreobates* (Sharpe, 1892) following White (1965). Meanwhile, it is hoped that DNA sequencing of both forms will be possible in the near future.

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I thank R. J. Dowsett and Françoise Dowsett-Lemaire for their valued advice and comments during the preparation of this note. I also thank Ron Demey, David Moyer and Brian Finch for their remarks, but above all I am grateful to Richard & Billy Fairburn for the remarkable photographs of a bee-eater taken at Malewa River Lodge near Naivasha, Kenya, which initiated this short note.

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The type specimen of Bonin Grosbeak *Chaunoproctus ferreorostris*

by Robert Prŷs-Jones & Nigel Cleere

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In their type catalogue of passerines held in the collection of the Natural History Museum (BMNH), Warren & Harrison (1971) recorded specimen BMNH 1855.12.19.39, which they considered an adult male but was referred to by Vigors (1839) as probably juvenile, as the holotype of Bonin Grosbeak *Chaunoproctus ferreorostris* (Vigors, 1829). However, Dickinson *et al.* (2001) refuted this and referred to BMNH 1855.12.19.39 as a lectotype of *C. ferreorostris*, on the basis that both Vigors (1839) and Sharpe (1888) had referred to two specimens, the other being BMNH 1855.12.19.71, noted by Vigors (1839) as probably adult on the grounds that 'Were we to judge from analogy, the more brilliantly plumaged bird would be the young, the more plainly coloured the adult; as is the case in the nearly allied group, the Pine Grosbeak, *Corythus enucleator*, Cuv.' (Vigors 1839: 22). These two specimens differ greatly in coloration, 1855.12.19.39 having much red in its plumage that 1855.12.19.71 entirely lacks.

Although Vigors (1839: 22) did note that 'There are two specimens of this species in the collection, differing, as above described, in their colours', in his very brief type description he mentioned only one (Vigors 1829), describing it using the identical Latin wording that he used in 1839 for the specimen he there defined as probably juvenile. Dickinson *et al.* (2001) are therefore incorrect that two syntypes ever existed, and specimen 1855.12.19.39 is indeed a holotype not a lectotype.

Warren herself had clearly originally been confused, as there is an initialled pencil annotation by her on the label of 1855.12.19.71 stating 'syntype. Another is selected'. She apparently derived this opinion from Sharpe (1888: 31), who wrote 'Voy. H.M.S. 'Sulphur.' (Types of species)' against his entry for the specimens. Sharpe was wrong about the voyage and that both specimens had type status, as Warren noted both for the voyage (Warren & Harrison 1971) and for the type status, regarding which she annotated 'no female was describ(ed)' in pencil against the entry for *C. ferreorostris* in an NHM library copy of Sharpe (1888) that she used in her types work.

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A new name for a subspecies of New World hawk

by Norbert Bahr

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Until recently, the phylogeny and systematics of birds of prey were based on morphological and behavioural traits (Stresemann & Amadon 1979, Wolters 1976, Amadon & Bull 1988, Thiollay 1994), which are often prone to convergence due to similarities in habitat use and prey spectra. With the development of molecular genetics and sophisticated statistical methods within the last two decades, it is now possible to study phylogenetic relationships within the Accipitridae more objectively, with the result that several recent molecular studies have revealed a far more complex picture of relationships at all taxonomic levels than hitherto supposed (Wink & Sauer-Gürth 2004, Helbig *et al.* 2005, Lerner & Mindell 2005, Kocum 2006, 2008, Griffiths *et al.* 2007, Haring *et al.* 2007). Many genera, as currently circumscribed (Stresemann & Amadon 1979, Sibley & Monroe 1990, Thiollay 1994, Ferguson-Lees & Christie 2001), do not form natural groups, but are of para- or even polyphyletic origin. This is especially true for the booted eagles and the buteonine hawks and kites, for which several taxonomic changes have been recommended or proposed (e.g. Riesing *et al.* 2003, Lerner & Mindell 2005, Clark & Schmitt 2006, Haring *et al.* 2007).

For more than a century, ten species of Neotropical buteonine hawks have usually been placed in the genus *Leucopternis* Kaup, 1847. Several phylogenetic studies, based on mitochondrial and nuclear markers, have convincingly shown that *Leucopternis* is highly polyphyletic (Lerner & Mindell 2005, Kocum 2006, Amaral *et al.* 2006, 2009, Lerner *et al.* 2008), forming six different clades that are not each others closest relatives. Amaral *et al.* (2009) erected new monotypic genera for two of the most aberrant species (now *Cryptoleucopteryx plumbeus* and *Amadonastur lacernulatus*), moved *L. schistaceus* to the genus *Buteogallus*, and resurrected the long-synonymized genera *Morphnarchus* Ridgway, 1920 (for *L. princeps*) and *Pseudastur* Blyth, 1850 (for *L. albicollis*, *L. occidentalis* and *L. polionotus*), leaving just *melanops* (the type species of *Leucopternis*), *kuhli* and *semiplumbeus* in *Leucopternis*. However, the latter six species (genera *Pseudastur* and *Leucopternis* of Amaral *et al.* 2009) are genetically nestled within *Buteo* and should, according to Kocum (2006) and Lerner *et al.* (2008), be included in that genus along with the monotypic genera *Asturina* and *Geranoaetus* (*cf.* Hellmayr & Conover 1949, Riesing *et al.* 2003, Lerner & Mindell 2005, Clark & Schmitt 2006, for supporting data) and, depending on the genus concept applied, also the more distantly related, likewise monophyletic *Rupornis*, *Percnohierax*, *Parabuteo* and *Morphnarchus*.

Accepting here the well-supported fusion of 'core' *Leucopternis* (including *melanops*, *kuhli* and *semiplumbeus*), *Pseudastur* (including *albicollis*, *occidentalis* and *polionotus*), *Asturina* and *Geranoaetus* with *Buteo*, following the above-mentioned studies, we have a three-fold homonymy concerning the name *costaricensis* in the newly circumscribed *Buteo*. The oldest name is *Buteo jamaicensis costaricensis* Ridgway, 1874. *Asturina nitida costaricensis* Swann, 1922, would become *Buteo nitidus costaricensis*, but that secondary homonym was already eliminated by Hellmayr & Conover (1949), who replaced it with *Buteo nitidus blakei*. The third name is *Leucopternis albicollis costaricensis* W. L. Sclater, 1919, for which, to my knowledge, no alternative name is available in synonymy if the species is moved to the genus *Buteo*. Accordingly I propose for it:

Buteo albicollis delhoyoi, nom. nov.

Following Art. 72.7. of the Code (ICZN 1999), the new name takes the type of *Leucopternis ghiesbreghti costaricensis* W. L. Sclater, 1919, under which name the taxon was originally described.

The new name honours the Spanish ornithologist Josep del Hoyo, initiator and editor of the monumental and magnificent *Handbook of the birds of the world*, for his outstanding contribution to bird conservation and ornithological science.

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Bulletin of the British Ornithologists' Club
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Volume 130, Number 3, pages 153–232

CONTENTS

Club Announcements 153

INDRAWAN, M., MASALA, Y., DWIPUTRA, D., MALLO, F. N., MALESO, A., SALIM, A., MASALA, F., TINULELE, I., PESIK, L., KATIANDAGHO, D. S. & SUNOSOL Rediscovery of the Critically Endangered Banggai Crow *Corvus unicolor* on Peleng Island, Indonesia, part 1: ecology 154

MALLO, F. N., PUTRA, D. D., RASMUSSEN, P. C., HERLINA, SOMADIKARTA, S., INDRAWAN, M., DARJONO, MALLO, I. N., SWEET, P., RAHMAN, A., RAHARJANINGTRAH, W., MASALA, Y. & VERBELEN, P. Rediscovery of the Critically Endangered Banggai Crow *Corvus unicolor* on Peleng Island, Indonesia, part 2: taxonomy 166

RHEINDT, F. E., VERBELEN, F., PUTRA, D. D., RAHMAN, A. & INDRAWAN, M. New biogeographic records in the avifauna of Peleng Island (Sulawesi, Indonesia), with taxonomic notes on some endemic taxa 181

MAURER, G., RUSSELL, D. G. D., WOOG, F. & CASSEY, P. The eggs of the extinct Egyptian population of White-tailed Eagle *Haliaeetus albicilla* 208

MEADOWS, B. S. On the status of Isabelline *Lanius isabellinus*, Turkestan *L. phoenicuroides* and Red-backed Shrikes *L. collurio* in the Eastern Province of Saudi Arabia 215

SCHODDE, R. The identity and sources of *Palaeornis anthopeplus* Lear, 1831, and *P. melanura* Lear, 1832 (Regent Parrot), and their neotypification 219

INGELS, J., CLAESSENS, O., LUGLIA, T., INGREMEAU, P. & KENEFICK, M. White Wagtail *Motacilla alba*, a vagrant to Barbados, Trinidad and French Guiana 224

TURNER, D. A. The correct type locality of *Cisticola chiniana humilis* Madarász, 1904, with comments concerning the true identity of the collector 227

TURNER, D. A. *Merops oreobates* (Sharpe 1892): a monotypic species or not? 228

PRŶS-JONES, R. & CLEERE, N. The type specimen of Bonin Grosbeak *Chaunoproctus ferreorostris* 230

BAHR, N. A new name for a subspecies of New World hawk 231

EDITORIAL BOARD

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29 March—Joe Tobias—*Singing in the rainforest: ornithological adventures in Amazonia*

Abstract: The forests of the Amazon basin support an incredible number of bird species, up to 600 at a single locality, and yet even the most basic details of their biology remain very poorly known. This talk describes the results of recent field work in Peru, Bolivia and Brazil, and hopes to shed a little light on some abiding mysteries, from the duet song of the antbirds to the origins of Amazonian diversity.

Biography: Joe Tobias studied the behavioural ecology of Robins *Erithacus rubecula* in Cambridge Botanical Gardens for his PhD, before working in international bird conservation for a decade. He returned to academia to study the evolutionary biology of tropical birds, and is now a lecturer based at the Edward Grey Institute for Field Ornithology in Oxford.

Those wanting to order the buffet supper should apply to the Chairman (address below) by **15 March 2011**

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14 June—Annual General Meeting—*followed by short talks*

Details will appear in the next Bulletin.

Those wanting to order the buffet supper should apply to the Chairman (address below) by **31 May 2011**

The Chairman: Helen Baker, 60 Townfield, Rickmansworth, Herts. WD3 7DD UK. Tel. +44 (0)1923 772441. E-mail: helen.baker60@tiscali.co.uk

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CLUB ANNOUNCEMENTS

Chairman's message: important changes to evening meetings

As I mentioned in the June Bulletin, we are reducing the number of Club meetings to just four in 2011 and we are also changing the format. There will be three evening meetings each commencing with a talk at 6.00 pm. Thereafter the bar will open and at 7.30 pm there will be refreshments for those who have booked them in advance. There will be no charge for attending the meeting and no need to book in advance unless ordering refreshments. Also, in an attempt to increase attendance, we will be advertising the talks locally and in birdwatching magazines in the UK.

Details of the first two evening meetings appear opposite. We expect the third to be in September. Our fourth meeting will be an all-day event, which we are hoping to organise jointly with another club on a Saturday in November. The provisional date is 12 November. It will be held in London. Details will be placed on the website as soon as possible.

Tony Statham is resigning as *Hon. Secretary* with effect from 31 December but will remain on the Committee until the AGM. I would like to thank him for all the work that he has done for the Club. Robert Prŷs-Jones is taking over as acting *Hon. Secretary* and David Fisher will become acting *Vice-Chairman*. I will serve as meetings organiser.

Helen Baker

The 959th meeting of the Club was held on Tuesday 26 January 2010 in the Sherfield Building, Imperial College, South Kensington, London, SW7. Fourteen members and six guests were present.

Members attending were: Miss H. BAKER (*Chairman*), S. E. CHAPMAN, F. M. GAUNTLETT, R. H. KETTLE, R. R. LANGLEY, D. J. MONTIER, P. J. OLIVER, R. C. PRICE, Dr R. P. PRŶS-JONES, R. J. PRYTHERCH, P. J. SELLAR, S. A. H. STATHAM, C. W. R. STOREY and M. J. WALTON.

Guests attending were: C. BOWDEN (*Speaker*), Mrs M. A. GAUNTLETT, Mrs A. J. McDONALD, Mrs M. MONTIER, Mrs H. PRICE and Ms N. RICHARDS.

After dinner, Chris Bowden gave an informative talk on *Conserving the Northern Bald Ibis Geronticus eremita—what's being done to halt centuries of decline in Morocco, Syria, Turkey and elsewhere*. The historical range and significance of Northern Bald Ibis starts in ancient Egypt where it had its own hieroglyphic symbol, and some recent work suggests it may already have been declining 4,000 years ago. Its disappearance was better documented from the European Alps >400 years ago, and since 1900 the range contraction has continued in North Africa and the Middle East, but most sharply since the 1950s when DDT and probably hunting caused extinction in the wild in Turkey (in 1989). The discovery of three relict pairs in Syria in 2002 was a welcome surprise, but even given the 100 pairs in Morocco at two coastal sites the species is still classified as Critically Endangered.

Feeding habitat is essentially open steppe and agricultural fields, and its diet a wide range of invertebrate and small vertebrate prey. The species breeds on ledges on inaccessible cliffs within 20 km of extensive feeding habitat. It is highly social, usually breeding and foraging in groups, and in the non-breeding period can congregate even more, making the species potentially vulnerable to one-off events. The Moroccan birds were afforded considerable protection when the Moroccan government declared the Souss-Massa National Park near Agadir in 1991, and the boundary of the park includes most feeding and breeding areas. RSPB research commenced in 1994 to identify actions to conserve the species. A key element has been recruiting and training seven local wardens, who were appointed from adjacent villages. They monitor the birds, help prevent disturbance by fishermen and tourists, and informally interact with local communities to inform them of the bird's importance. More specific interventions have been the provision of safe freshwater drinking points, which improve breeding productivity, as well as very occasional predator control. Systematic data collected in the foraging areas have been crucial for securing the protection of some key areas otherwise threatened with development for tourism. A related piece of work demonstrated that fallow areas left uncultivated for 2+ years support far higher lizard populations, and maintaining this regime may prove key to the long-term survival of the ibis. Half of the ibis population breeds just outside the national park, at Tamri, and this area urgently requires greater protection. The population was just 59 breeding pairs in 1997, following a mystery die-off, but had increased to 108 pairs by 2009 largely due to some of the above measures.

The eastern population winters in Ethiopia, as revealed by recent satellite tracking of the Syrian breeders, whilst Moroccan birds are much more sedentary. Learning more about the route and causes of mortality has already raised the alarm that hunting may well be a key reason for recent declines and urgently needs to be addressed.

Semi-wild (Turkey) and (mainly European) zoo populations are far more numerous than the wild birds. At Birecik (Turkey) the birds are free flying for six months, and recent release trials have shown promising signs of the potential to re-establish wild populations and even to supplement the precariously tiny Syrian population. An international group (the International Advisory Group for Northern Bald Ibis) established in 1999 has successfully helped channel efforts and resources, more recently through input to an International Species Action Plan. By involving key expertise representing the diverse interest groups and range state governments, and most recently via www.iagnbi.org where reports and priorities are readily available, there is now coordinated guidance available to help the species improve its still precarious status.

The 962nd meeting of the Club was held on Tuesday 22 June 2010 in the Sherfield Building, Imperial College, South Kensington, London, SW7. Fifteen members and two guests were present.

Members attending were: Miss H. BAKER (*Chairman*), Cdr. M. B. CASEMENT RN, Prof. R. A. CHEKE, F. M. GAUNTLETT, Dr L. D. C. FISHPOOL (*Speaker*), A. GIBBS, D. GRIFFIN, R. H. KETTLE, R. R. LANGLEY, Dr C. F. MANN, D. J. MONTIER, P. J. OLIVER, Dr R. P. PRŶS-JONES, S. A. H. STATHAM and M. J. WALTON.

Guests attending were: Mrs C. R. CASEMENT and Mrs M. A. GAUNTLETT.

After dinner, Dr Lincoln Fishpool gave an interesting and comprehensive talk on *BirdLife International's Important Bird Area programme: a global perspective*. Important Bird Areas (IBAs) are the sites-based component of BirdLife's conservation work. The origins of IBAs date to the late 1970s, when ICBP, the forerunner of BirdLife, was asked to help develop the means to implement the EU's Bird Directive. Since then, the programme has become global and over 10,000 IBAs have now been identified worldwide.

IBAs are identified using a set of standardised selection categories using data gathered locally, analysed nationally and coordinated regionally, and it is these connections that are one of the reasons for the programme's success. One measure of this has been the designation of new protected areas—for example, as the result of a ten-country project in Africa, the proportion of IBAs with legal protection increased from 55% to 70% in 1998–2007.

Information for >200 countries and territories has been published in seven regional directories and over 120 national publications, while boundaries have been digitised for *c*.95% of sites. With the majority of sites now identified, at least on land, emphasis is shifting to monitoring. Using a simple methodology, information is collected locally, largely by volunteers, to produce indicators of 'state', 'pressure' and 'response' for each site. These can be integrated to provide assessments of status and trends at IBAs nationally and regionally, which have powerful advocacy messages.

While IBA coverage now extends to almost all terrestrial and freshwater parts of the globe, this is not the case for the marine environment. Methods for IBA identification at sea are still being developed, including, for example, exploring how the results of seabird satellite tracking can be used to inform IBA boundary designation. BirdLife is collaborating with Wetlands International and other organisations to develop a 'Critical Site Network Tool' for waterbirds in the region covered by the Africa-Eurasian Waterbird Agreement. Combining IBA information with International Waterbird Census data, the 'Wings Over Wetlands' project has looked at site networks from a flyways perspective. This has included assessments of how complete the coverage of each population is, based on comparisons of total numbers at known sites with the size of the population as a whole, thereby pointing up potential gaps. The tool can be seen at www.wingsoverwetlands.org/csntool.

IBA networks are also being examined for their likely resilience in the face of projected climate change between now and 2080. This includes assessments of the scale of projected turnover of priority species at sites. Such studies have also highlighted those sites whose climates are not anticipated to change significantly over this period, heightening their importance for conservation.

REVIEW

Cleere, N. 2010. *Nightjars of the world*. Wild Guides, Maidenhead. 464 pages, many maps and 580 colour photographs. UK£45.00.

Covering not only nightjars, but also potoos, frogmouths, owlet-nightjars and the remarkable Oilbird *Steatornis caripensis*, this is a truly lavish production and very welcome, notwithstanding that three other major reviews of the Caprimulgiformes have appeared in little over a decade. A series of short introductory chapters treat expected topics including general biology and taxonomy, but set the scene for what is to come in being superbly illustrated. Some stunning images appear in this part of the book; those of Pennant-winged Nightjar *Macrodipteryx vexillarius*, Standard-winged Nightjar *M. longipennis* and Sickle-winged Nightjar *Eleothreptus anomalus* all on p. 30, and the 'flycatching' Long-tailed Potoo *Nyctibius aethereus* are personal favourites. Thereafter the individual accounts treat 135 species, i.e. 16 more than in Cleere (1998) and 17 more than in Holyoak (2001), and this still does not take account of yet more potential species-level taxa in South America alone. 'New' species recognised here include Tepui Nightjar *Antrostomus roraimae* (split from Band-winged Nightjar *A. longirostris*), Palau Nightjar *Caprimulgus phalaena* (split from Jungle Nightjar *C. indicus*), Indochinese Frogmouth *Batrachostomus continentalis* (split from Javan Frogmouth *B. javensis*) and Solomons Frogmouth *Rigidipenna inexpectata* (split from Marbled Frogmouth *Podargus ocellatus*). It is worth mentioning that only in half of these cases does the text make explicit the background, which seems an oversight.

Each species account typically covers 2–4 pages, occasionally six, of which only one page is devoted to text and maps. As already intimated, the standard of the field photography is stunningly high. One imagines that if the same author had attempted a similar guide in the 1990s, when his Pica Press monograph appeared, the result would have been substantially different and many more taxa would have relied on use of specimen images. In any case, some of the museum 'studies' used here augment photos of live birds, rather than being mere substitutes. It is surprising, however, that all four images of the relatively abundant Tawny-collared Nightjar *Antrostomus salvini* are of specimens. Each photograph is labelled as to age, sex and racial identity, wherever possible or relevant. The credits, including locality, date and photographer's name, comprise one of the book's end sections, but are well laid out, permitting the reader to very swiftly find the relevant details, unlike in some guides where such information is less accessibly presented. On the negative side, it might also be noted that for South American localities at least, use of accents is massively flawed and quite a few other spelling mistakes have crept in too, despite two named editors!

The very brief texts cover length, identification, main confusion species, vocalisations, habitat, breeding, range (including that for different subspecies, where appropriate), and status, as well as the IUCN Red List category as of 2009. Their brevity means that in a handful of cases, quite some white space goes 'begging' (see, for examples, pp. 102, 110, 122 and 134). Thumbnail outline sketches of both sexes in flight to show the distribution of pale markings in the wings and tail would have been useful 'fillers', at least for all of the Caprimulgidae. Multiple generic changes are recognised by Cleere based on new genetic and other evidence, most notably with the resurrection of *Antrostomus* for many Western Hemisphere nightjars formerly placed in *Caprimulgus*. With characteristic 'bad' timing, yet another paper substantially resolving our understanding of Caprimulgiform generic relationships appeared just too late to be taken into account. It would be interesting to know Cleere's rationale for persisting to use a hyphen in Donaldson-Smith's Nightjar *Caprimulgus donaldsoni*, when both the explorer himself (see the title page to *Through unknown African countries*, published in 1897; www.biodiversitylibrary.org/item/45895#9) and his contemporaries did without. Sharpe, for instance, who named several taxa for him, including the nightjar, always referred to Donaldson Smith (e.g. *Bull. Brit. Orn. Cl.* 4: 28–29, 32, 41; 5: 14).

Two maps are provided for every species, one 'identifying' the species' range on a world map, the second depicting the distribution in some detail. The maps represent one of the weakest components, in my experience. Although visually pleasing, quite some of the New World species are compromised by inaccuracies. Neither Hispaniolan Nightjar *Antrostomus ekmani*, much less Least Poorwill *Siphonorhis brewsteri*, occurs throughout Hispaniola, as Latta *et al.* (2006, *Birds of the Dominican Republic and Haiti*, Christopher Helm) made abundantly clear, while Todd's Nightjar *A. heterurus* is mapped for extreme north-west Guyana, but the first and all subsequent country records are from the far south (see Milensky *et al.*, 2009, *Bull. Brit. Orn. Cl.* 129: 119–120). Given that the text is so brief on this (and other topics), that the maps should be as accurate as possible becomes doubly important, especially as this could impact identification, an aid to which is apparently one of the book's principal aims. Other examples of missed distributional data include the following. Spot-tailed Nightjar *A. maculicaudus* and Ladder-tailed Nightjar *Hydropsalis climacocerca* both range across the rio Araguaia into Tocantins (Pinheiro & Dornas, 2009, *Biota Neotropica* 9: 187–205), Silky-tailed Nightjar *Antrostomus seriocaudatus* occurs further south in Brazil than shown (Rupp *et al.*, 2007, *Rev. Bras. Orn.* 15: 605–608), Least Nighthawk *Chordeiles pusillus* is reasonably widespread across suitable habitat in the interior of southern and eastern Brazil, e.g. in Minas Gerais, but also south to Rio Grande do Sul (Sick, 1997, *Ornitologia brasileira*, Ed. Nova Fronteira; Repenning & Fontana, 2008, *Rev. Bras. Orn.* 16: 58–63), while Long-tailed Potoo occurs over the eastern Brazilian littoral from Bahia to Paraná, not, as shown, over the northern Cerrado zone (Sick *op. cit.*). I have personally observed the latter species in four different states in the relevant region, and to 1,100 m (considerably higher than the maximum elevation given by Cleere). Given the 'barrage' of publications on the distributions of Neotropical birds, in particular, in recent years, it is unsurprising that the author has been unable to keep abreast of everything, but then it might have been wise to enlist (more) assistance?

These criticisms aside this book has, dare I say it, set a new standard in avian photographic guides. Expensive perhaps, but not for the amount of work that has gone into its preparation, and remember too that a percentage of all sales is donated to BirdLife International. Some might dismiss it as not sitting comfortably in any genre, neither a monograph nor a complete identification guide, and certainly not a coffee-table book, but I'm certain that just as many others will simply enjoy it for being the visual feast that it undoubtedly is. Cleere will, I'm sure, stimulate more than a few of his readers to track down these nocturnal treats, and I have a feeling that he has also sown the seeds for similar guides to other groups.

Guy M. Kirwan

REFEREES

I am grateful to the following, who have reviewed manuscripts submitted to the Bulletin during the last year (those who refereed more than one manuscript are denoted by an asterisk in parentheses): Alexandre Aleixo, Per Alström, Richard C. Banks, Bruce Beehler, Walter Boles, W. R. P. Bourne (*), Frederik Brammer, Mark Brazil, Vincent Bretagnolle (*), Michael Brooke, Paul Buckley, Peter Castell, Santiago Claramunt (*), Anthony S. Cheke, R. Terry Chesser, Diego Cisneros-Heredia, William S. Clark (*), Nigel Cleere (*), Mario Cohn-Haft, Nigel J. Collar, Charles T. Collins, Martin Collinson, Ron Demey (*), Edward C. Dickinson (*), Robert J. Dowsett, Françoise Dowsett-Lemaire, Guy Dutson (*), Clemency T. Fisher, Juan F. Freile (*), Hilary Fry, Anita Gamauf, Steven M. S. Gregory (*), George Henderson, Robert O. Hutchinson, Mike Imber, Johan Ingels, Morton L. Isler, Oliver Komar, Reiko Kurosawa, P. Andrew Lassey, Paul J. Leader, Mary LeCroy, Jeremy Lindsell, Huw Lloyd, Wayne Longmore (*), Clive Mann, Ian McAllan, Peter Meininger, Hiroyuki Morioka, Julian O'Halloran, Fábio Olmos, Penny Olsen, David Parkin, José Fernando Pacheco (*), Robert B. Payne, Alan Peterson (*), Theunis Piersma, H. Douglas Pratt (*), Thane Pratt (*), Robert Prŷs-Jones (*), Pamela C. Rasmussen (*), Robin Restall, Jon Riley, Mark B. Robbins, C. S. Roselaar (*), Tatiana Santander, Richard Schodde (*), Chris Sharpe, Frank Steinheimer (*), Lars Svensson (*), Colin Trainor, David R. Wells, Andrew Whittaker, Gary Wiles, Bruce Young and Kevin J. Zimmer (*).—THE HON. EDITOR

Recent records of new and rare bird species in Costa Rica

Luis Sandoval, César Sánchez, Esteban Biamonte, Jim R. Zook, Julio E. Sánchez, Daniel Martínez, Daryl Loth & Jerry O'Donahoe

Received 2 December 2009

Summary.—We report new data on distribution, colonisation and breeding of 17 species recently recorded in Costa Rica for the first time, such as Greater Shearwater *Puffinus gravis* and Savanna Hawk *Buteogallus meridionalis*, as well as information for nine other species with few previous records in Costa Rica, e.g. Green-winged Teal *Anas crecca*, Ocellated Poorwill *Nyctiphrynus ocellatus* and Chipping Sparrow *Spizella passerina*. The majority of new records involve species that have expanded their range north from Panama (11 species), due principally to deforestation.

Since the publication of Stiles & Skutch (1989), the distribution and abundance of some resident (Sandoval 2004, Sandoval & Ellis 2006) and migratory species has changed in Costa Rica (Garrigues & Dean 2007). For example, species such as Melodious Blackbird *Dives dives* have become common throughout the country (Sánchez *et al.* 1998). Furthermore, 19 species have been recorded for the first time, primarily from the Pacific south-west, the Caribbean coast, and on Cocos Island (Acevedo-Gutierrez 1994, Sánchez *et al.* 1998, Barrantes *et al.* 2002, Solano-Ugalde & Herrera 2005, Garrigues & Dean 2007, Obando *et al.* 2007a, 2008). Most recently recorded species inhabit open areas, forest edge or secondary forest (Sánchez *et al.* 1998, Garrigues & Dean 2007), all of which habitats have recently increased in Costa Rica due to deforestation (Roxero-Bixby *et al.* 2002, Barrantes & Lobo 2005, Joyce 2006). Here we provide information on distribution, colonisation and breeding of 17 species recently recorded in Costa Rica (including the country's territorial waters) for the first time (Fig. 1). We also provide new information for nine other species with few previous records for the country. Most data included here were obtained in 1997–2009, and photographs will be archived at the Unión de Ornitólogos de Costa Rica, San José. We also include data provided by other observers, whose full names are given in the Acknowledgements.

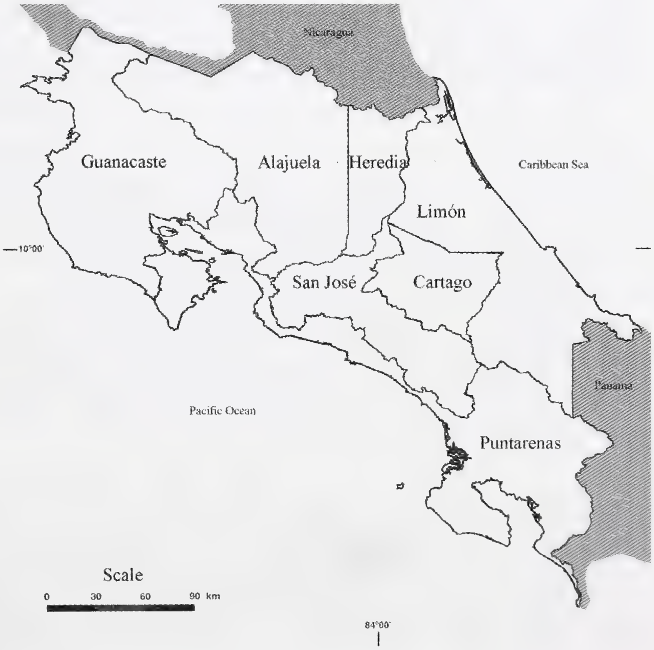

Figure. 1. Map showing Costa Rica's provinces and borders.

Species accounts

GREEN-WINGED TEAL *Anas crecca*

The first and only previous record was in 1962 (Stiles & Skutch 1989). Five new records are as follows. An adult male was at Finca Las Concavas, Cartago (09°50′N, 83°53′W; 1,300 m) in late December 1999–early March 2000 (CS, JES & RG). It was with Blue-winged Teals *Anas discors* and Black-bellied Whistling Ducks *Dendrocygna autumnalis*. A male was in Palo Verde National Park, Guanacaste (10°20′N, 85°21′W; 25 m) on 12–16 February 2000 (JZ). Two males were at Lagunas Catfish Farms, near Comunidad, Guanacaste (10°32′N, 85°37′W; 40 m) on 15–29 February 2008 (JZ & CJ) with many other ducks. A female was seen there on 16 March 2008 (JH). A female was with six *A. discors* on a small pond at Cenizas de Pérez Zeledón, San José (09°18′N, 83°42′W; 750 m) on 1 March 2008 (JZ).

GREATER SHEARWATER *Puffinus gravis*

Although the bones of a shearwater found in Tortuguero, Limón, were considered to belong to a Greater Shearwater (Carr 1979), their identification has been questioned, and there are no confirmed Costa Rican records (Stiles & Skutch 1989, Obando *et al.* 2007a). On 22 June 2007 an exhausted male was found on the beach at Tortuguero, Limón (10°33′N, 83°30′W); it died the same day (Museo de Zoología, Universidad de Costa Rica; UCR 4156). To our knowledge, the closest records to Costa Rica are from Venezuela, where the species has been seen offshore in June and August (Hilty 2003), Trinidad & Tobago (Hayes & White 1999), and Quintana Roo, Mexico (Ash & Watson 1980). The date of the Costa Rican specimen coincides with the species' northbound migration (Harrison 1985), which in the Caribbean Basin seems to peak in early to mid June through the Lesser Antilles (Buckley *et al.* 2009).

AMERICAN WHITE PELICAN *Pelecanus erythrorhynchos*

Accidental in Costa Rica, with just two previous reports (Stiles & Skutch 1989, Garrigues & Dean 2007). A single was at the mouth of the río Parismina, Limón (10°18′N, 83°21′W; 1 m) on 5 January–19 February 1999 (JES). It was observed with Brown Pelicans *P. occidentalis* on a riverbank. A few days later, one was at Parque Vargas, in downtown Limón (09°59′N, 83°01′W; 2 m), close to the port (JES). We suspect that the same individual was involved in these two records, given their geographical proximity.

STRIATED HERON *Butorides striata*

The two previous records for Costa Rica involve a specimen taken in April 1923 at Cañas, Guanacaste (Stiles & Skutch 1989) and a sight record from Alajuela in 2005 (Obando *et al.* 2007b). The third record, and the first from the Pacific coast, was an adult photographed at the border of a rice field near mangrove at Esterillos, Parrita, Puntarenas (09°31′N, 84°28′W), on 2 March 2008 (WC).

SAVANNA HAWK *Buteogallus meridionalis*

We report the first records for Costa Rica. The first was observed on 15 April 2008, 5 km south of Zancudo, Puntarenas (08°29′N, 83°06′W; 5 m), perched on a fence at the edge of a rice field being ploughed (JOD). Subsequently, two adults and an immature were nearby, at La Cuesta, Puntarenas (08°28′N, 82°52′W; 60 m), on 24 February 2009 (SE) and 5 March 2009 (JZ), also in a rice field being ploughed. Common in open country west of Colón, Panama (CS pers. obs.), the species was expected in Costa Rica (Stiles & Skutch 1989) given its preference for open habitats, which are now widespread in the Pacific lowlands (Joyce 2006).

PEARL KITE *Gampsonyx swainsonii*

The first report in Costa Rica was on 30 November 1996 at La Trocha de Pérez Zeledón, San José (09°21′N, 83°40′W; 650 m). Most subsequent observations are from the south of the country, especially in the Pacific lowlands to 1,200 m. We report the first breeding records and the first sightings on the Caribbean coast. Breeding has been noted mainly in the southern Pacific lowlands, where at least four nests have been found at two localities. The first was at Talari Mountain Lodge, Perez Zeledón, San José (09°25′N, 83°40′W; 840 m), early in 2000 (PW). Another was at Bajo Coto, Buenos Aires, Puntarenas (08°57′N, 83°04′W; 313 m) in February 2005; it contained two chicks of unknown age (EB). In 2006, presumably the same pair built a nest *c*.50 m away; on 17 March it contained three fully feathered chicks. Another nest was observed on 19 March 2006 in Talari (CS), but its stage could not be determined. All nests were of sticks and small branches, were placed in partially leafless trees 18–20 m up in the canopy, and were similar to those described elsewhere (Thiollay 1994). All nests in Costa Rica have been on the Pacific slope during the dry season (December–April). The species has presumably dispersed north from Panama as far as Rincón de la Vieja and Palo Verde in Guanacaste. Since 2006, there have been three records on the Caribbean coast: singles near Sixaola, Limón, near the Panama border (09°33′N, 82°53′W; 50 m) on 4 January 2008 (LS), on the coast *c*.30 km south of Puerto Limón (09°47′N, 82°54′W; 2 m) on 1 December 2007 (FPM), and between Estero Negro and Puerto Viejo, Limón (09°47′N, 82°53′W; 2 m) on 31 January 2009 (DM).

CLAPPER RAIL *Rallus longirostris*

One observed in a mangrove by JES, on 16 June 1997, near the confluence of the ríos Bebedero and Tempisque, at the head of the Gulf of Nicoya, Guanacaste (10°15′N, 84°14′W; 21 m) was the first record for Costa Rica. Despite the lack of subsequent reports, Garrigues & Dean (2007) suggested that the species is resident in mangrove on the Gulf of Nicoya. The species' status and distribution in the tropics is poorly understood, and given the lack of further records, and the dispersal ability of rails, we cannot eliminate the possibility that this bird was a wandering individual.

SOUTHERN LAPWING *Vanellus chilensis*

Since the first record for Costa Rica, in 1993, along the río Sarapiquí (Sánchez *et al*. 1998), the species has increased throughout the country. On the Pacific slope it has reached north as far as Palo Verde National Park and its environs (Trama *et al*. 2006), and on the Caribbean slope as far north as Arenal (CS). Two were in the Central Valley, at Valle del Sol, San José (09°56′N, 54°12′W), on 2 October 2007 (LB), increasing its elevational range in the country to 850 m. Nesting has been observed at two sites at Los Lagos, Arenal (10°29′N, 84°43′W; 300 m), in consecutive years. The species continues to expand its range, mainly in humid lowland pastures (JZ).

LONG-BILLED CURLEW *Numenius americanus*

Three recent observations of this rare migrant (Stiles & Skutch 1989, Garrigues & Dean 2007). Singles were at Playa Azul, Garabito, Puntarenas (09°78′N, 84°64′W) on 26 February 2005 (DM), in a fallow rice field at Pelón de La Bajura, Guanacaste (10°26′N, 85°25′W; 20 m) on 19 November 2005 (JZ), and at Salinas Santos, Colorado de Abangares (10°10′N, 85°06′W; 5 m) on 10 September 2008 (FPM).

LARGE-BILLED TERN *Phaetusa simplex*

The first report was on 15 March 2003 at the río Tortuguero, Limón (Obando *et al*. 2007a,b, Garrigues & Dean 2007), while the second record involved one at Matina, Limón (10°06′N, 83°11′W; 2 m) on 13 June 2007 (DL), *c*.58 km south of the first. *P. simplex* inhabits freshwater habitats and is common throughout South America as far north as the Colombia / Panama border (Ridgely & Gwynne 1989). Vagrancy even further north is known, as there are two specimen records from Cuba, both from the north coast, one on an unknown date and the other taken on 28 May 1910 (Garrido & Kirkconnell 2000).

WHITE-CROWNED PIGEON *Patagioenas leucocephala*

Just one previous record, involving one seen in flight, on the Caribbean coast, at the mouth of the río Tortuguero, Limón, in March 1987 (Stiles & Skutch 1989). Garrigues & Dean (2007) mentioned subsequent records, but without dates or locations. JES observed one on 8 February 2005, also in Tortuguero (10°33′N, 83°30′W), feeding on *Miconia* sp. (Melastomataceae) fruits at the edge of a canal in mature secondary forest with Yolillo palms *Raphia taedigera* (Arecaceae). Further records from Costa Rica were considered likely, given that the species apparently ranges to mainland areas from its island breeding grounds in search of food (Stiles & Skutch 1989).

BROWN-THROATED PARAKEET *Aratinga pertinax*

First recorded in 1996 near the Panama border in the southern Pacific (Sánchez *et al*. 1998). Since then, its range has expanded through the disturbed lowlands west to La Gamba–Golfito (83°10′N, 08°43′W; 80 m) (Garrigues & Dean 2007). Further range expansion is evidenced by a flock at Palmar Sur (08°55′N, 83°27′W; 14 m) on 13 January 2006 (LS), the westernmost report in Costa Rica. The highest-elevation report involved a small flock at Sabalito de Coto Brus, Puntarenas (08°49′N, 82°55′W; 920 m) on 24 August 2002 (JZ). Although we are unaware of any breeding records, we expect that this parakeet nests in the country, because the population is resident and is quite common in the Pacific lowlands near the Panama border.

GREATER ANI *Crotophaga major*

First reported in Costa Rica in 2003–04 at Tortuguero (10°33′N, 83°30′W) (Garrigues & Dean 2007), during 2005 and January 2010 a single was observed (DL) on several occasions in forest edge vegetation along freshwater channels in Tortuguero, Limón, to Cuatro Esquinas Island (10°32′N, 83°30′W). The habitat is similar to that occupied by the species elsewhere (Hilty 2003). There is one previous record even further north, two birds collected in Tamaulipas, Mexico, in 1960 (Olson 1978).

NORTHERN POTOO *Nyctibius jamaicensis*

Considered uncommon in the Pacific dry forest (Garrigues & Dean 2007), although there are few data on the species' range and habitat preferences in Costa Rica (Barrantes *et al*. 2002, Obando *et al*. 2007a). There is a previous report of one at Santa Rosa National Park, Guanacaste (10°50′N, 85°37′W; 50 m), in April 2006 (Obando *et al*. 2007a). The easternmost record in Costa Rica involves a single observed at Punta Morales, Puntarenas (10°04′N, 84°57′W; 5 m), on 16 November 2008 (LS & EB), feeding on insects attracted to a light at the edge of a mangrove. Approximately one hour later, the bird was heard singing. On 2 December 2008, JES & JF observed a pair at the same locality. Our observations in north-west Costa Rica, and the Santa Rosa record, were in deciduous forest and adjacent mangrove.

OCELLATED POORWILL *Nyctiphrynus ocellatus*
Previously recorded only at Brasilia de Upala, Alajuela (Stiles & Skutch 1989), the species' current status in Costa Rica is considered uncertain (Garrigues & Dean 2007). On 13 February 2007 one was heard calling at Finca Las Crucitas, San Carlos, Alajuela (10°52′N, 84°19′W; 56 m), 86 km east of the first record (CS). The bird vocalised continually from 19.00 to 20.30 h next to a patch of partially logged forest, with tall trees (*c.*35 m) and a dense understorey, in an area where gold mining has reduced the forest to remnant patches. The night was clear with no moon. Next night, one was heard in the same area, at *c.*18.30 h, but it only called twice. The species' range in Central America is poorly known. For example, in northern and central Nicaragua it is rare and inhabits montane forest at 800–1,000 m (Martínez-Sánchez 2007), whilst in Honduras there is an isolated population (Anderson 2000) and in Panama there is just unconfirmed record from the Canal Zone (AOU 1998).

MOUSE-COLOURED TYRANNULET *Phaeomyias murina*
First recorded in Costa Rica in 1996, when one was mist-netted at La Trocha de Pérez Zeledón, San José (Sánchez *et al.* 1998). The northernmost observation on the Pacific coast was at Carara National Park, Puntarenas (09°46′N, 84°36′W; 34 m) on 13 December 2008 (LS). The first report on the Caribbean coast involved one at Comadre–Fila Carbon, Limón (09°42′N, 82°49′W; 20 m) on 22 January 2009 (DM). Direct evidence for breeding is lacking, but it presumably breeds in the San Vito Valley, where the species is apparently resident and increasing (JZ).

RUSTY-MARGINED FLYCATCHER *Myiozetetes cayanensis*
The first report was at La Gamba, Golfito, Puntarenas, on 7 April 2004 (MD; Garrigues 2004), while the second was at Tiskita Lodge, Pavones, Puntarenas (08°21′N, 83°08′W; 5 m), on 2 March 2005 (CS), perched beside an airstrip in second growth. On 26 March 2006, RG found a nest at La Gamba, Golfito, Puntarenas (83°10′N, 08°43′W, 80 m). The nest was typical of the genus, being a roofed structure constructed of grass fibres (Skutch 1976, Stiles & Skutch 1989). It was in a shrub, 1 m above a freshwater canal. The entrance was possibly at the bottom, as the nest did not appear to have a side entrance, and the nest tree was 3 m from a dirt road, in a pasture. The birds perched *c.*30 cm from the nest. The date and location above water are consistent with Dyrcz's (2002) observations on Barro Colorado Island in Panama.

TROPICAL MOCKINGBIRD *Mimus gilvus*
The first report for Costa Rica was at Siquirres, Limón, in 2000 (JES). *M. gilvus* is now a resident breeder, with nesting recorded in several areas on both slopes (e.g. in downtown Limón (09°59′N, 83°01′W; 5 m), Siquirres (10°05′N, 83°30′W; 90 m) and La Fortuna de Arenal (10°28′N, 84°39′W; 250 m). Several have been observed in the Central Valley, including at Cartago, where two were seen in July–August 2004 (CS) visiting a feeder, consuming bananas. Also in this area, another adult was feeding a juvenile at Las Concavas (09°50′N, 83°53′W) on 29 October 2008 (JES, LS, DM). A report in El Rodeo-Coronado, San José (09°58′N, 84°00′W; 1,434 m), on 14 November 2006 (EB), and another in Oratorio-Oreamuno, Cartago (09°53′N, 83°49′W; 1,700 m), on 11 April 2009 (DM), are the highest-elevation records in Costa Rica. In Panama, the species has expanded its range since the 1930s (Ridgely & Gwynne 1989). To the north, the population has also been expanding rapidly south through Nicaragua (JZ pers. obs.). Thus, mockingbirds appear to be expanding their ranges from both the north and south in Central America. In addition, numbers in Costa

Rica have increased since their arrival. We predict that it will become common in residential and open areas of Costa Rica, as has occurred elsewhere (Cody 2005).

NASHVILLE WARBLER *Vermivora ruficapilla*

Recorded sporadically in the last 20 years (Stiles & Skutch 1989, Garrigues & Dean 2007), with two recent observations. The first was at Chomes, Puntarenas (10°02′N, 84°54′W; 5 m) on 21 September 2006 (LS, EB), where two birds foraged in a mangrove next to salt ponds. One was at Tirimbina Forest Reserve, Sarapiquí (10°23′N, 84°08′W; 187 m) on 13 and 22 February 2007 (JZ).

GOLDEN-CHEEKED WARBLER *Dendroica chrysoparia*

The first records in Costa Rica are as follows. A female in non-breeding plumage was in a shade-coffee plantation at Cerro Pata de Gallo, Palmares, Alajuela (10°02′N, 84°28′W; 1,450 m), on 2 September 2002 (JZ). Single females were observed in Coronado, San José (09°58′N, 84°00′W), at 1,434–1,800 m, on 9 and 16 September 2003 (EB). The first was a lone bird foraging in a pine (*Pinus* sp.) in a garden and the second was accompanying a mixed-species flock in an area of pastures, living fences, second-growth alders *Alnus acuminata* and remnants of natural vegetation. These are the southernmost reports for this globally threatened species, whose wintering grounds extend from the highlands of Chiapas, Mexico, to northern Nicaragua (AOU 1998).

CHIPPING SPARROW *Spizella passerina*

Previously known in Costa Rica from observations in San Pedro, San José, in September 1977 (Stiles & Skutch 1989) and at Cahuita, Limón, in November 2001 (Garrigues & Dean 2007). Two additional observations are as follows. One was at Coronado, San José, on 20 October 2001 (EB); it fed on a dirt road with three Rufous-collared Sparrows *Zonotrichia capensis*. One in breeding plumage was at Savegre, Cerro de la Muerte (09°33′N, 83°48′W; 2,320 m), in November 2008 (IA); it was perched 2 m high in a bush at the edge of secondary forest.

LARK SPARROW *Chondestes grammacus*

First observed in Costa Rica in the early 1990s at Carara National Park, Puntarenas, where the species was seen in December (CG), at a border between forest and extensive grassland. No further records until 2005, since when three observations have been made, all by JZ. The first was at Cenizas de Pérez Zeledón, San José, on 5 March 2005, perched atop a citrus tree within a new, mixed-species, reforestation plot (*Terminalia amazonia*, Combretaceae, and *Tabebuia* sp., Bignoniaceae). Another was at Chomes, Puntarenas (10°02′N, 84°54′W; 5 m) on 22 November 2006. The last was a single at La Angostura de Pérez Zeledón, San José (09°17′N, 83°41′W; 750 m), on 29 March 2007, perched briefly in the top of a 10-m *Tabebuia rosea* tree between a recently harvested sugarcane field and a shade-coffee plantation.

LINCOLN'S SPARROW *Melospiza lincolnii*

A very rare migrant (Stiles & Skutch 1989, Garrigues & Dean 2007) for which three recent observations are available, all of singles: in a garden with isolated trees and bushes in Manzanillo, Limón (09°37′N, 82°39′W; 5 m), on 15 October 2005 (EB); near La Virgén del Socorro, Heredia (10°16′N, 84°10′W; 750 m), on 21 February 2006 (CS), foraging in a pasture next to secondary forest with four Yellow-faced Grassquits *Tiaris olivaceus*; and at Moravia de Chirripó, Turrialba (09°49′N, 83°26′W; 1,120 m), on 29 March 2008 (LS, GF).

SHINY COWBIRD *Molothrus bonariensis*
First observed in Costa Rica at Hone Creek, Talamanca, Limón, on 26 April 2004 (Martínez & Carman 2004). We report several observations from the Caribbean slope, and also present evidence of breeding. On 5 October 2005, DM observed three immature males (with contrasting rufous-brown flight feathers) near Hone Creek. On 16 June 2007, two males and two females were at Tuba Creek, Talamanca (DM). On 21 January 2007, also in Talamanca, DM saw six males foraging with Bronzed Cowbirds *M. aeneus* in pasture at Carbon I, Limón (09°40′N, 82°49′W). During March and May 2008 several were present in the Turrialba area. On 9 March, EC observed at least six at the Centro Agronómico Tropical de Investigación y Enseñanza (09°53′N, 83°39′W; 600 m), and on 29 March and 27 April, LS, EB & GF observed several males and females foraging with Bronzed Cowbirds at Moravia de Chirripó, which at 1,130 m is the highest elevation in Costa Rica to date. In May 2009, EB and the staff of La Selva Biological Station (Sarapiquí, Heredia, 10°25′N, 84°00′W; 35 m) observed a fledgling being fed by a pair of Band-backed Wrens *Campylorhynchus zonatus*, the first breeding record for the country.

CRESTED OROPENDOLA *Psarocolius decumanus*
The first observation in Costa Rica was in 1999, when it was found in the upper Coto Brus Valley (Garrigues & Dean 2007). Since then the species has apparently spread. In 2000, the first colony was found at San Bosco de Sabalito, Puntarenas (08°53′N, 82°55′W; 950 m), and later that year ten more colonies were found in the Coto Brus Valley, at Ciudad Neily and Coto Colorado (JZ). Subsequently, colonies have become commoner in Sabalito, Puntarenas. A colony with three nests was found in February 2006, between Río Claro and Palmar Sur, Puntarenas (08°43′N, 83°09′W; 80 m), in an isolated tree next to the Pan-American Highway (LS). Further, several individuals have been observed away from the Coto Brus Valley. The highest record is on Cerro Pitier, La Amistad International Park (09°01′N, 83°02′W; 1,300 m), on 18 March 2006 (LS). The westernmost record is at Bajo Coto, Puntarenas (08°57′N, 83°04′W; 313 m), where a male was seen in a small *Erythrina* (Papilionaceae) tree, on 17 March 2006 (LS). On 15 February 2007, LS saw one flying over the río Tigre on the Osa Peninsula (08°31′N, 83°24′W; 130 m). The establishment of new colonies and sightings of singles or small groups further west signal ongoing range expansion.

TRICOLOURED MUNIA *Lonchura malacca*
The first observation was at La Guinea, Guanacaste, in May 1999, where a population became established (Garrigues & Dean 2007). Significant range expansion has followed. On 16–23 February 2005, LS observed a group of *c*.500 adults and young in Pitaya, Miramar, Puntarenas (10°00′N, 84°48′W; 5 m). At the same location, on 15 January and 16 February 2006, LS observed a group of *c*.50, both adults and young, feeding in a rice field surrounded by sugarcane plantations. On 21 September 2006, at Chomes, Puntarenas, LS & EB observed two adults at the edge of mangrove. On 2 September 2008, JZ saw two adults in a rice field near Palmar Sur, Puntarenas (08°56′N, 83°27′W; 15 m), *c*.250 km from La Guinea. The species is associated with rice fields in Costa Rica, as it is elsewhere (Funes & Herrera 2005). Rice is grown extensively on the Pacific coast, presumably explaining the species' expansion.

Discussion

The species reported here can be subdivided into five groups according to geography and / or habitat: (1) coastal and pelagic species (one), (2) species that have expanded north from Panama (11), (3) North American vagrants (nine), (4) rediscovered species in the country (two), and (5) miscellaneous (four).

Coastal and pelagic species.—Ornithological observations in oceanic waters of Costa Rica are infrequent, making new records, such as that presented here, to be expected. Interestingly, two new species reported in Costa Rica, Greater Shearwater (see above) and Cory's Shearwater *Calonectris diomedea* (Solano-Ugalde & Herrera 2005), are from the Caribbean coast, which coastline is much shorter than the Pacific. The high diversity of seabirds in the eastern Pacific (Ballance *et al*. 2006) could still produce new records for Costa Rica. There has been a recent increase in efforts to search for pelagic species in this region, which has produced new records for Costa Rica such as Black-vented Shearwater *Puffinus opisthomelas* (B. Sullivan pers. comm.), Christmas Shearwater *P. nativitatis* (Brinkley 2008) and Manx Shearwater *P. puffinus* (Garrigues & Dean 2007).

Species from Panama.—Several recent additions to the Costa Rican avifauna are of species presumably spreading north from Panama, especially those that inhabit open or semi-open habitats, e.g. Brown-throated Parakeet, Rusty-margined Flycatcher and Crested Oropendola. Open habitats have increased in Costa Rica during the last 50 years, including on the southern Pacific slope near the Panama border (Barrantes & Lobo 2005, Joyce 2006).

North American vagrants.—Most observations of North American vagrants involve single individuals, which have presumably overshot their normal winter range, or reflect deteriorating conditions in wintering habitats further north.

Rediscovered species.—Both species are nocturnal and could have been overlooked previously. Northern Potoo is probably uncommon in dry forest and adjoining mangrove. Previous Costa Rican records of Ocellated Poorwill are from poorly surveyed areas (along the central border with Nicaragua), where more field work is needed.

Miscellaneous.—The three species (*Phaetusa simplex*, *Crotophaga major* and *Patagioenas leucocephala*) concerned were all seen on the Caribbean slope. These accidental records may all represent vagrants. Tricoloured Munia was introduced as a pet in Costa Rica (LS pers. obs.), and apparently some were released or escaped around Filadelfía, Guanacaste, where the first observation was made, although it has since increased its range along the Pacific coast.

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Further records and updates of range extension in House Crow *Corvus splendens*

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Summary.—Over the last century, House Crows *Corvus splendens* have spread, primarily ship-assisted, to establish populations in 21 countries outside their native range, the Indian subcontinent. This spread is adversely impacting both humans and avifauna in the areas colonised. This paper is the fourth update on this global invasion. Though long established at many ports around the Indian Ocean, and making regular appearances in ones and twos on ships arriving in Australia, the species is now increasingly turning up in the Atlantic region, both on the east coast of the USA, in the Caribbean, and on European coasts; a breeding population has been established in Hoek van Holland since 1994. They are also extending their range in South-East Asia. Some extralimital colonies are spreading along neighbouring coastlines and overland into the interior, though their progress appears to be obstructed by arid depopulated zones such as the interior of Arabia and the Horn of Africa.

Though native to India, Pakistan, the Maldives and Sri Lanka, and Myanmar and western Yunnan, House Crow *Corvus splendens* has proved to be an invasive alien species, and is spreading progressively around the world. The first step was the deliberate release of House Crows in the late 1800s to Aden, Klang and Zanzibar, though subsequent spread has been ship-assisted. Their invasion west and south, to the Arabian Peninsula, Red Sea, East and southern Africa, Mauritius and the Seychelles, has been on ships originating from major ports in the Indian subcontinent, such as Mumbai and Colombo, but also from Aden, Suez and Zanzibar, which now possess large populations. They have also spread east throughout Malaysia and Singapore since its introduction in Klang.

Extralimital colonies usually become established from just 2–3 founder individuals which have arrived at a port, and over the course of 2–3 decades they achieve pest status as the population grows. Their adverse impacts include predation / harassment of native avifauna and livestock, food / crop theft, noise nuisance, fouling of human settlements and water tanks, and they are potential carriers of human and other animal diseases.

This paper is the fourth in a series that has reported the progressive global spread of the House Crow and provided further information on their status at sites where the species has become established (Ryall 1994, 1995, 2002). The present update draws on published records, information provided in correspondence, including in response to requests for information in journals, data sent to the House Crow Monitor website (www.housecrow.com), and a questionnaire by authorities in countries with introduced House Crow populations, issued by CR and Guntram Meier in 2007–08. Contributors' initials are given in the text and their names are presented under Contributors.

Europe

Netherlands.—The breeding population established in Hoek van Holland from a founding pair in 1994 has grown, reaching at least 11 in 2003 (Ryall 2003) and 28 by January 2008 (GO). Ottens & Ryall (2003) published a detailed review of occurrence in the

Netherlands up to 2002, including several reports of individuals many kilometres from the founder colony. Though some of these are attributable to birds from the Hoek van Holland, more distant records, e.g. from Kollummerland, Schiermonnikoog and Den Hoorn, probably represent additional ship-assisted arrivals. In 2004, a single House Crow was seen in central Rotterdam, another flew past at Bergambacht, *c.*20 km east of Rotterdam, and a third was at Noordwijkerhout, on the coast west of Leiden (www.birding.holland.com), perhaps suggesting spread from the founder population. In 2004 a satellite population was reported in Park Ockenburg, Den Haag, 17 km north of Hoek van Holland (Langley 2004), though the lack of recent reports (GO) suggests that this colony did not succeed.

Belgium.—On 21 May 2004, two House Crows were observed at the village of Wachtebeke, East Flanders (GO). Their closeness to several international ports, including Terneuzen (20 km distant), Vlissingen (38 km) and Oostende (60 km) suggests they arrived by ship, as the colony at Hoek van Holland is 100 km distant.

Poland.—A bird identified as a House Crow was photographed by MF on 29 April 2002 trying to take Black-headed Gull *Larus ridibundus* eggs at a fish pond at Palczowice, near Oświęcim, *c.*40 km west of Kraków. WS states that the record has been listed in Poland under Schedule E—'species from captivity, as well as unintentionally introduced, which have not established self-supporting populations (unnatural occurrence)'. The bird was not recorded again and was assumed to be an escapee, though firm evidence was lacking (WS). Certainly, the fact that the location is *c.*500 km from the nearest coastline at Gdańsk makes it extremely unlikely that this bird arrived by ship.

Hungary.—A single was reported by FF in a car park in Budapest on 4 May 2002. It was suggested by FF that this and the Polish bird were the same bird. However, as pointed out by Ottens & Ryall (2003), this would have necessitated the bird flying a mean 50 km for six consecutive days, in a straight line, over mountainous terrain. Such behaviour seems quite out of character for a House Crow. An alternative explanation is that it was a misidentified hybrid Carrion Crow *C. c. corone* × Hooded Crow *C. c. cornix*.

Spain.—PH saw a single House Crow perched on a roof calling, at the seaside village of Parada, Cabo Fisterra, on 6 March 2004, which is close to a major shipping route to European ports. This constitutes the second report for the country.

Middle East

Israel.—In addition to the long-established population in Eilat, now numbering *c.*600, up to ten were seen regularly at Yotvata, 40 km to the north (OH), but according to the Yotvata Farm Office they are no longer present. Each winter, a further 200 were reported to move to Eilat from neighbouring Aqaba in Jordan and from Taba, across the border in Egypt (OH). OH suggested they might have been attracted by a greater availability of food there, in the form of crops, livestock barns and human refuse, but the movement no longer appears to be occurring. House Crows are frequently seen in Arava, north of Eilat (Roll *et al.* 2008), probably encouraged by refuse tipping in the surrounding desert. They are considered a pest in Israel, particularly due to the species' tendency to attack people eating in the open or passing close to nest sites, and control measures are being taken.

Socotra (Yemen).—A small population, peaking at 28 birds, established on Socotra in 1996 (Ryall 2002). Control measures took the form of trapping and a bounty system under which local children brought nests with young to the Socotra Conservation and Development Programme (Pitches 2009), which helped reduce the population to 13 centred on Hadibu. These were all shot by a marksman in May 2009 (OA-S). This is the second successful eradication of a breeding population, the first being in Seychelles in 1994 (Ryall

2002). Constant surveillance will be required to prevent them recolonising this biodiversity-rich island, given the regular shipping traffic from House Crow-infested Aden.

Kuwait.—A nesting pair was reported by Gregory (2004) on Kubbar Island, Kuwait's most important seabird colony. In view of the House Crow's status as a serious nest raider, control measures were planned. Gregory also mentioned reported breeding in the port of Shuwaikh, on the south side of Kuwait Bay. Despite the continued proliferation of House Crows in coastal towns and settlements throughout much of the Arabian Peninsula, the population in Kuwait remains small with, as of mid 2008, the highest recorded number being 18 (MP).

Afghanistan.—House Crow has been referred to as a vagrant to Afghanistan, e.g. Sayer & van der Zon (1981) reported one at Khowst, in eastern Afghanistan, in 1964, but evidence of residency was lacking. However, in 2002, the species was reported as uncommon at Torkham, Jalālābād, east of Kabul (Kullberg 2002).

Africa

Morocco.—A single adult seen in Tangier harbour on 25 December 2002, the first for Morocco, has been accepted by the Moroccan Rare Birds Committee (Bergier *et al.* 2005).

Egypt.—Established in Suez since the 1920s and thence along the Red Sea coast at least as far south as Quseir (Ryall 1994). The population in Suez is now large and Demey (2008) reported 3,811 leaving a single roost in July 2007. They were first reported in Sinai by Goodman & Meininger (1989), but are now established in several coastal towns there, including El Tur in the west (Robel 1996), Sharm El Sheikh in the south and Dahab on the Gulf of Aqaba (SBD). According to OH they are also present in Taba, further north on the latter coast near the border with Israel. Balmer & Murdoch (2009) reported a single House Crow just south of Sehel Island, Aswan, on 25 March 2009, which was wholly unexpected given that the main population around Suez is *c.*700 km to the north and the nearest populations, on the Red Sea coast, are *c.*200 km across desert.

Eritrea.—Present in Massawa since 1968 (Ash & Atkins 2009), but the species was not present there or elsewhere on the coast or the Dahlak Archipelago in 1962 (CM) and it was well established there and in Assab by the 1980s (Ryall 1994). YY has recently provided population estimates from these localities of 2,500–3,000 and 6,000–7,000, respectively. He also reported the birds as now present in small numbers in Tio and other small ports and on some offshore islands. House Crow roosts now number hundreds and they most probably breed on the island of Sheikh Said, 1.3 km off Massawa (EA).

Djibouti.—House Crows were first reported in Djibouti City in 1958 (Ryall 1994) and were very common by 1978, to the extent that several control campaigns have been attempted since. Ryall (2002) reported colonisation of coastal towns to the north and south. HR reports further spread to all coastal villages south to the border with Somalia, as well as the villages around Djibouti City, up to 26 km inland. Since at least 1998, the birds have reached Musha and Maskali islands, *c.*14 km off Djibouti port. These are important nesting sites for 15 bird species and a potential Ramsar site, and HR has observed heavy predation of chicks by House Crows during the breeding season (June–August) as well as of turtle hatchlings.

Somalia.—The Eritrea, Djibouti and Somali populations are now inter-linked and represent a serious pest problem (Redman *et al.* 2009). From the burgeoning population in the port of Berbera (Ryall 2002), they have spread to the city of Hargeysa (AJ), >100 km inland and, according to JM, have been present in the port of Bosasso since the late 1990s, which population is thought to have originated from Djibouti. AJ reports that they have now colonised almost all Somali coastal towns from Berbera west to the Djibouti border.

Of greater conservation concern is the occurrence of House Crows on the Saada Din archipelago off the north coast, close to the border with Djibouti, where the species is now frequent on the island of Jasiira Ceebaad (AJ). These islands are an important breeding area for terns, gulls and shorebirds, which could be seriously impacted by House Crows.

Kenya.—The species remains restricted to the coastal strip in Kenya, with a range similar to that described in the late 1980s (Ryall 1992b), from Msambweni in the south to Mambrui, 40 km north of Malindi, though the populations in those settlements within this range have grown substantially. However, House Crows have recently been reported on the island of Lamu in the extreme north (CJ), presumably having arrived by boat. Very large populations exist at the main human population centres around Mombasa and Malindi–Watamu. Inland, they remain restricted to *c*.50 km from Mombasa along the Nairobi Road. The increase is despite control programmes that operated from 1994 to 2005/6 (CJ) in Malindi–Watamu and Mombasa, which achieved major reductions in numbers at both locations, but the impetus eventually faltered due to a lack of access to the avicide, Starlicide.

Tanzania.—House Crows were first released on Zanzibar in the 1890s and by the 1970s had established in Dar es Salaam and Tanga on the mainland (Ryall 1994), where large populations are now driving the spread overland to other parts of the country. From Tanga, on the north coast, they have spread to Muheza, along the road to Segera (PN) and are in danger of reaching there and Korogwe, and thence to villages such as Kinole and Tegetero in the biodiversity rich Uluguru Mountains (CW). The first House Crow has been reported recently in Mtwara, *c*.300 km south of Dar es Salaam and close to the border with Mozambique (NB).

A large population now exists in Morogoro, having spread inland from the enormous population in Dar es Salaam (NB), from whence they have reached Mikumi (CW). Efforts continue to reduce the population in Dar es Salaam, where it is regarded as a serious pest and threat to native avifauna (NB). In April 2007, K. Berendse (*in* Wolstencroft 2007) reported seeing four at Dodoma airport, but these appear to have perished along with large numbers of Pied Crows *Corvus albus* during the periodic crow eradication exercise the authorities undertake there.

House Crow has a varied history on Pemba Island. On the basis of an unpublished communication from J. G. Williams in 1962, Long (1981) reported House Crows as present on Pemba, but Pakenham (1979) and subsequent visitors did not record them there. However, in mid 2007, AH reported *C. splendens* as common at Wete port, in the north of the island, roosting in the mangroves. Apparently they had been there for at least three years and have increased and spread inland to other settlements, where they are reported to take chicks of domestic fowl. AH (*in* Wolstencroft 2007) also reported a small but growing population at Chake-Chake, in the centre of Pemba, which might have come from Wesha port. J. Bishop (*in* Wolstencroft 2007) found them common at Unguja. These birds probably arrived by ship from either Zanzibar, *c*.50 km distant, or Tanga, *c*.60 km away, and present a serious threat to the island's endemics, e.g. Pemba Green Pigeon *Treron pembaensis*, Pemba Sunbird *Cinnyris pembae* and Pemba White-eye *Zosterops vaughani*. Fortunately, measures are being taken to eradicate the population. House Crows are also long established and numerous on the small island of Chumbe, off western Zanzibar (FL).

Mozambique.—House Crows have spread further since my previous reports (Ryall 1994, 2002) and were seen in Beira and Nacala in 2006 (CB).

Indian Ocean Islands

Seychelles.—Since the eradication of the breeding population in 1994 (Ryall 2002), a number of single individuals have been reported, most probably new ship-assisted arrivals

(Skerrett *et al.* 2001). As of February 2008, the last House Crow on Mahé had been shot by a police marksman (NS).

Chagos Islands (British Indian Ocean Territory).—A single was seen some years ago and by late November 2008 two were present (GM). In view of the large amount of US military ship traffic from Bahrain, Aden and Singapore to Diego Garcia, the main island, there is a high risk of further occurrences of ship-assisted House Crows in the archipelago.

Mauritius.—The long-established population continues to be centred in Port Louis, and Feare & Mungroo (1990) described the species' spread to surrounding settlements. They are also seen occasionally over forest in the south-west of the island (R. J. Safford *in* Lever 2005).

Réunion.—According to Cheke & Hume (2008), two House Crows were seen together in 2004 in the north of the island at the capital and main port, St-Denis, and were assumed to have 'hitched' a ride on a ship from Mauritius. Both were eventually shot by officers from the Forestry Department (Cheke 2008; ML) and no further House Crows have been seen on the island subsequently (AC).

Rodrigues.—Two were seen at Port Mathurin in mid 1995 (MMr) and it was reported that the local authorities, being aware of their pest status on Mauritius, intended to shoot them.

Andaman Islands.—The species' history on this archipelago is particularly interesting. As described in Ryall (1994) a deliberate introduction attempted in the 1860s, to clear refuse, failed. However, small numbers were reported in the main port, Port Blair, in 1988 (Pittie 1988). As of 2007, the population has expanded substantially and House Crows gather in large numbers at fish landing centres near the town. MC reports that House Crows are present in most urban centres in the Andamans now and they have also spread to larger settlements further north in the archipelago, at Rangat and Maya Bandarup to Diglipur on North Andaman. They are also present further south, at Hud Bay on Little Andaman (MC).

East Asia and Australia

Malaysia.—Wells (2007) provided a detailed account of the origins, status and overland spread of the House Crow from its introduction in Klang in the late 1800s to other parts of the peninsula. They colonised George Town, Pinang Island, and by 1953 had established in Butterworth on the opposite mainland. They had spread to Kulim by 1983, to the Merbok estuary by 1991, with small groups in Alor Setar by the late 1990s and on Langkawi Island by 1995. Their spread had reached Kuala Lumpur by the 1960s and the Negeri Sembilan coast and Melaka in 1972, where it is now abundant, and to Tanjung Karang and Kajang town by 1983. They reached Johor Baru from Singapore in the early 1960s and thence along the coast to Kota Tinggi by 1998. In the north they have also recently spread into Thailand.

There are also a few reports from Malaysian Borneo. In Sabah, a single House Crow was observed by an expedition of the Western Foundation of Vertebrate Zoology at an abattoir in Papar on the west coast in 1983 (Sheldon *et al.* 2001). In addition, SH reported seeing a single on three occasions in July 1997 and two on 7 August 1999 in the capital, Kota Kinabalu. Whether these birds originated from self-introduction, deliberate introduction or escape from captivity is unknown, though the first is most probable, given that the widespread population in Peninsular Malaysia would facilitate ship-assisted introduction. According to Mann (2008), these birds were erroneously reported as Slender-billed Crow *C. enca* in Smythies (1999). A local birdwatcher, AS, reports there having been several around Kota Kinabalu for 'several years'. A detailed survey of the city by CR in June 2006 revealed only four birds—a breeding pair, a subadult and a juvenile being fed, all of which roosted in an avenue of trees close to the fish market.

Thailand.—Peters (1962) suggested that the race *C. s. insolens* in south-west Thailand might have been introduced, presumably from neighbouring Myanmar, but Lekagul & Cronin (1974) described it as a rare resident. Whether native or not, the House Crows which have recently colonised Phuket (see below) appear to be *C. s. protegatus* (CR) of Sri Lanka and south-west India, but also introduced into Malaysia and Singapore, rather than the darker *C. s. insolens* of neighbouring Myanmar. This suggests that the Phuket birds originate from the northward spread in Malaysia (Wells 2007) or, possibly, from ship-assisted introduction via Colombo. A House Crow was seen in Krabi on 5 June 2001 (BCST 2001), at least three at the Phuket recycling centre on 26 April 2003 (BCST 2003) and three in Muang District, Phuket on 5 October 2004, where a small population is now established around the municipal rubbish tip (BCST 2004). In October 2007, covering the waste had reduced the numbers at the recycling centre to one (phuketbirder.blogspot.com/2007_10_01_archive.html). In 2006, the resident population of House Crows in Phuket, seen usually around the city dump, numbered *c*.15 (BCST 2006). Two others were at Darn Sadao, Hat Yai (Songkhla), on the east coast, on 5 November 2004 (BCST 2005).

Singapore.—Peh & Sodhi (2002) observed that, prior to the 1980s, House Crows had been mainly coastal in distribution, in docklands, rivers and canals, coastal parks and on offshore islands, but in recent years had become common in urban areas. Wee (1999) attributed the recent increase to the development of new housing estates. Wells (2007) reported a record from the island of Senang in Singapore. However, numbers have now reached at least 20,000 occupying 25 roosts in tall trees, such that they have achieved pest proportions (SKL) and the authorities are undertaking a control programme. Numbers are swollen by birds arriving from neighbouring Malaysia (Wells 2007, which see for more detail). Brook *et al*. (2003) estimated the population at 130,000 birds.

Hong Kong.—Twelve House Crows were recorded in ones and twos between the mid 1970s and 1998 (Leven & Corlett 2004). Viney *et al*. (1996) noted their presence in the territory but regarded them as escaped captives. The population had clearly grown as flocks of 10–20 were seen regularly in the area (Fung 2000). Nevertheless, Carey *et al*. (2001) did not consider the species to be established in Hong Kong. M. Kilburn (pers. comm.) reported observing them regularly around the port area since late 1998. By 2004, a population of *c*.100 was present in urban Kowloon, centred on the container port and associated cargo-handling facilities (Leven & Corlett 2004), with roosts in large trees in various small city parks. The latter authors expressed concern about the threat that this rapidly growing population could eventually pose to other wildlife, such as the nearby egretry, particularly as the birds were probably already too numerous to easily eradicate. The population was estimated at 200–250 in 2003 (Lee & Choi 2005). According to Lee & Chow (2007), the population numbered 210 centred mainly on Stonecutters Island, Sham Shui Po Park, Tai Hang Tung, Yau Yat Tsuen, Kowloon Tsai Park, Tung Chau Street Park, and Lai On and Lai Kok Estates. They pointed out that the control programme implemented since 2004 had dispatched 830 crows, thereby stemming the hitherto rapid population growth.

Taiwan.—VY reported that several single House Crows were seen on the island of Kinmen, west of Taiwan, near the Chinese mainland, since the first record in 1980 (Ryall 2002), but that the last record was of a single in southern Taiwan.

Australia.—In Western Australia, two House Crows were seen on Rottnest Island, off Perth, in 2006 (MM). The following year another two were seen on the Angel Platform, an offshore gas rig, and another travelled by boat the 140 km from the rig to Cape Lambert, near Port Samson in northern Western Australia (Pownall 2009), and another was present at nearby Karratha in 2010 (MM). The birds were thought to have ridden on the rig when it was towed from Malaysia (MM). The former birds were shot in mid-December 2008 (LW) but, to date, the Karratha bird has evaded destruction (MM). In eastern Australia, a single House Crow was seen over several months from March 2008 at Dee Why in north-east Sydney (LW), but the local authority intended to shoot it.

The Americas

USA.—A pair was discovered at Nokomis, near Sarasota, Florida in late 2001. They bred in 2003 when a nest with three young was photographed (Pranty 2004), one of the birds later being electrocuted when it hit a power line. No House Crows were located during a visit to the site in early 2009 (BP), suggesting that the remaining birds had relocated or died out. In May 2008, a single House Crow was seen over eight days in coastal woodland near Johnson's Bayou at Hackberry Ridge, Louisiana (Anon. 2008) and it was suggested that due to its tameness and signs of feather wear the bird had been caged in the recent past. The coastal location suggests a ship-assisted arrival. The bird disappeared thereafter.

Cuba.—A single House Crow was seen by AP on 26 March 2008 at Cayo Guillermo on the north coast (Kirwan *et al*. 2008). The bird remained all day around an open-air cafe feeding on scraps, but was not seen again subsequently (AP). As this is close to a major shipping route the bird was probably ship-assisted.

Discussion

House Crows have now colonised ports and coastal towns in 21 countries outside their native range and, in addition, have arrived ship-assisted in a further 16 countries, but without having established breeding populations. The spread continues unabated and is, in fact, accelerating, occurrences extending increasingly far from the species' native range, in part due to the large introduced populations in Aden and Suez, which act as secondary foci for spread, along with an increase in the amount and speed of modern international shipping. Indeed, an observed increase in the rate of invasions of a range of other species has been attributed to the expansion of global trade (Jenkins 1996, Ruiz & Carlton 2003), much of it maritime.

Despite House Crows having been self-introducing around the Indian Ocean and Australia for around 100 years, it was only in 1971 that the first was reported in the Americas, in New Jersey (Ryall 1995), but since then there have been 4–5 reports in the USA and others in Chile, Barbados (Ryall 2002) and Cuba (this paper).

The spread of populations around the Indian Ocean rim has, with only a few exceptions, been restricted to coastal areas where human populations are concentrated. In fact, in the Middle East, the Horn of Africa and Kenya, the species' overland spread has been limited by arid and unpopulated hinterlands. However, Tanzania lacks such a barrier, which suggests that their spread west overland, now *c*.250 km from their point of arrival in the country, will continue and provide a conduit for the species to spread to Rwanda, Uganda and beyond. The sterling efforts being made to eradicate House Crows from Dar es Salaam and ultimately elsewhere in Tanzania (NB) could yet prevent the species from invading the interior of Africa. In South Africa, too, effective control measures have halted the expansion of populations in Durban and Cape Town, thereby reducing the risk of House Crows reaching ports on the west coast of Africa, as well as stemming their spread to the interior of the country.

In South-East Asia, the House Crow's colonisation of the Thai-Malay Peninsula and surrounding islands, described in detail by Wells (2007), will doubtless be followed by invasion of Laos and Vietnam. In addition, they are well established in Hong Kong and increasing in Borneo. Even in Europe the inaction of the authorities in the Netherlands to eliminate the colony in Hoek van Holland—an easy task when two arrived in 1994—is permitting the House Crow population to increase rapidly and there are already signs of the birds spreading.

The poverty, overcrowding and accumulation of human refuse that accompany rapid human population growth around cities in the developing world greatly facilitate the proliferation of House Crows. The predictable adverse effects, including a decline in native avifauna, killing of young livestock and poultry, crop raiding and food theft, and potential spread of human disease (Ryall 1992a,b), will exacerbate the plight of communities who already have very little. Nevertheless, it is possible to reverse the trend. Two introduced populations of House Crows, albeit small ones on islands, have been eradicated, on Seychelles and Socotra, and control programmes in South Africa have met with great success. Others would also have succeeded had they received greater support from international agencies.

Contributors

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Documented records of White-cheeked Tody-Tyrant *Poecilotriccus albifacies* from Acre, Brazil

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Summary.—We summarise the history and currently understood distribution of White-cheeked Tody-Tyrant *Poecilotriccus albifacies* and provide documentation regarding two records of the species from Acre, Brazil. These records, one of which refers to a male found and photographed by the authors, and the other of which involved a pair collected in 1998, are the first documented records for Brazil. In discussing these records, we examine the association between *P. albifacies* and bamboo-dominated habitats, and reassess the likely status of the species in Brazil.

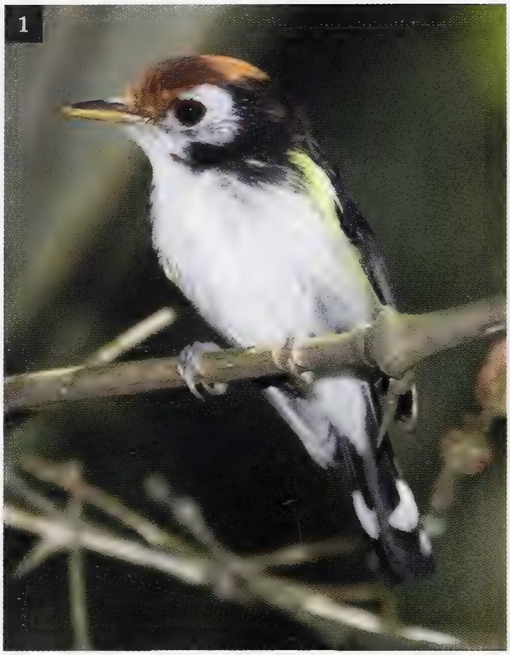
White-cheeked Tody-Tyrant *Poecilotriccus albifacies* is a distinctive, sexually dimorphic tyrannid with a localised distribution in upper Amazonia. Described as *Todirostrum albifacies* by E. R. Blake (1959) from a single specimen collected on the left bank of the Boca del río Colorado, dpto. Madre de Dios, Peru, it remained essentially unknown until rediscovered at Explorer's Inn (Tambopata Reserve), dpto. Madre de Dios, Peru, on 19 August 1979, by T. A. Parker (Parker 1982). Parker (1982) provided the first published observations on the natural history and vocalisations of *P. albifacies*, and also reported on unpublished specimens collected by J. W. Fitzpatrick and M. B. Robbins. Parker (1982: 488) noted that *P. albifacies* seemed to be 'entirely restricted to *Guadua* bamboo', a habitat association that has subsequently been documented by many researchers (e.g. Kratter 1997, Fitzpatrick *et al.* 2004).

In the intervening years, *P. albifacies* has been found at several additional localities, but until recently, it was considered endemic to the Southeast Peruvian Lowlands Endemic Bird Area (EBA), with all published records being from southern dpto. Madre de Dios, and north-eastern dpto. Cusco, in south-east Peru (Fitzpatrick *et al.* 2004). Tobias & Seddon (2007) reported the first confirmed record from Bolivia, a pair, the male of which was photographed and sound-recorded, in *Guadua* bamboo at Extrema, dpto. Pando, in November 2004. Tobias & Seddon (2007) noted that Extrema was *c.*20 km from the nearest known Peruvian locality for *P. albifacies*, and therefore, the species' presence in Bolivia was not unexpected. However, they also noted that a three-day search of similar habitat across a wider area in the Extrema region failed to yield additional records of *P. albifacies*, nor did more intensive field work by other researchers (Alverson *et al.* 2000) at three sites (some with extensive bamboo) slightly further downstream along the ríos Tahuamanu and Muyumanu in dpto. Pando.

In this paper, we report on two records of *P. albifacies* from Brazil, one quite recent, and the other, an unpublished and seemingly overlooked record from more than a decade ago. Collectively, these two records provide the first substantiated evidence of the occurrence of *P. albifacies* in Brazil.

Results

On 3 September 2009 EG was escorting KJZ and AW at the Parque Zoobotânico (09°57′S, 67°57′W; 250 m), a field station managed by the Universidade Federal do Acre (UFAC),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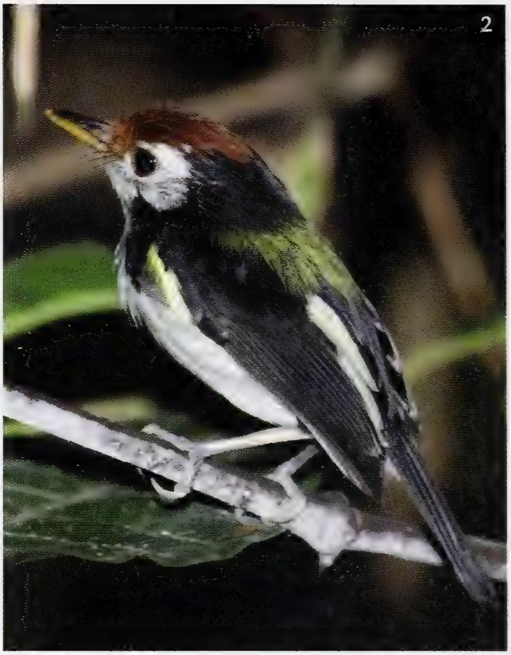
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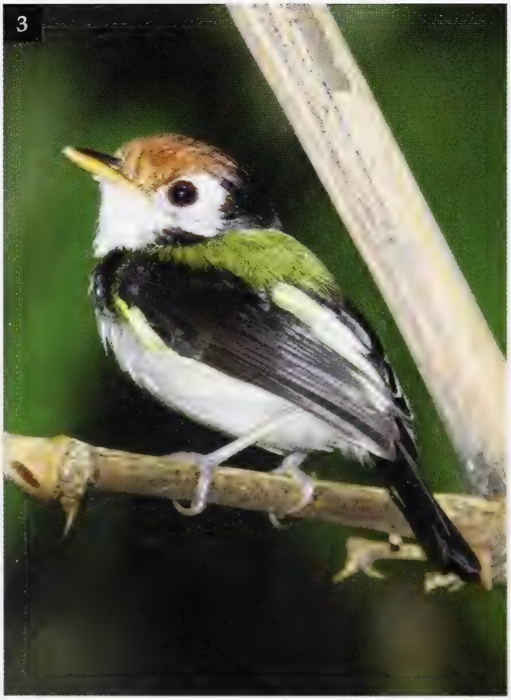
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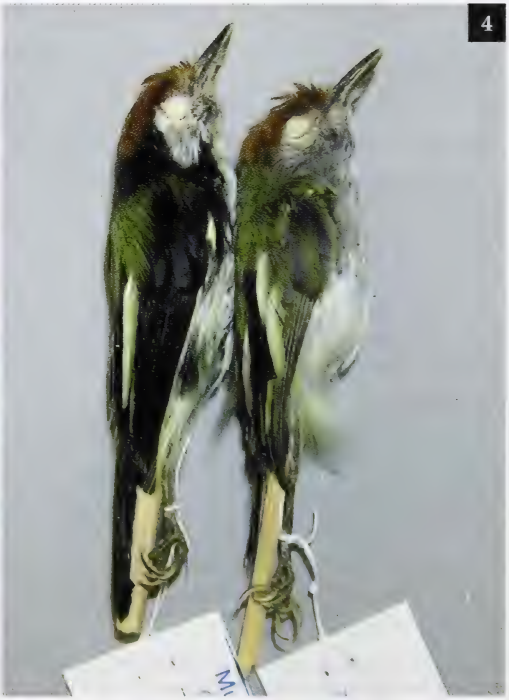
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Figures 1–3. Male White-cheeked Tody-Tyrant *Poecilotriccus albifacies*, UFAC Parque Zoobotânico, Rio Branco, Acre, Brazil, 3 September 2009 (Kevin J. Zimmer)

Figure 4. Male (left; MZUSP 80226) and female (right; MZUSP 80227) White-cheeked Tody-Tyrants *Poecilotriccus albifacies*, collected in the FLONA de Macauã, Acre, Brazil, in March 1998 by Paulo Martuscelli, and deposited at the Museu de Zoologia da Universidade de São Paulo (MZUSP), São Paulo, Brazil (Kevin J. Zimmer)

within the suburban limits of Rio Branco, the capital of the state of Acre. This site comprises *c.*100 ha of humid lowland forest with extensive *Guadua* bamboo (Guilherme 2001, Tobias *et al.* 2008). While tape-recording a Bamboo Antshrike *Cymbilaimus sanctamariae* in one such stand of *Guadua* in mid-morning, we heard a different vocalisation coming from the canopy of the bamboo. The vocalisation, which was delivered at well-spaced intervals of up to 15 seconds, was a series of 7–10 emphatic, *pip* or *pup* notes (with a distinctive, 'popping' quality) that accelerated after an initial pause between the first and second notes. KJZ recognised the voice, from previous field experience in Peru, as being that of *Poecilotriccus albifacies*. AW & KJZ immediately began tape-recording the bird, which went silent after a few minutes. After a few seconds of playback, AW spotted a small bird *c.*15 m above ground in a vine tangle in the central portion of an emergent tree, and visually confirmed that it was a male White-cheeked Tody-Tyrant. Additional playback stimulated the bird to drop much lower, into the bamboo understorey, where all three of us obtained identifiable photographs (Figs. 1–3). The bird responded to playback by giving additional songs similar or identical to those given spontaneously. It also gave a low-amplitude series of run-together grating notes as apparent agonistic calls. The bird behaved in a highly territorial manner, and remained in the general vicinity, alternating bouts of vocalising with periods of foraging for the next few hours. During this time, it foraged everywhere from 1.5–12.0 m above the ground, mostly within crowns of the bamboo, but also in the more open understorey of the bamboo, as well as in vine tangles along trunks and interior portions of major limbs of emergent trees. Virtually all foraging manoeuvres observed were short, darting, upward sally-gleans to the undersides of foliage (mostly bamboo leaves), stems, or vines. At no time did we see or hear a second bird. KJZ and AW re-visited the site again on the mornings of 5 and 13 September and did not hear or see *P. albifacies*, although they did not employ audio playback again. As of January 2010, EG had not relocated *P. albifacies* at the Parque Zoobotânico.

Discussion

Our record from UFAC is only the second for Brazil. The first Brazilian record was a presumably mated pair that was mist-netted and collected by PM in March 1998, in Ombrophylous Forest dominated by arborescent bamboo in the Floresta Nacional do Macauã, near the rio Macauã, in the Sena Madureira district of central Acre (09°52'S, 69°23'W). The specimens, a male (MZUSP 80226) and female (MZUSP 80227), are held at the Museu de Zoologia da Universidade de São Paulo, São Paulo (MZUSP). KJZ & AW examined and photographed (Fig. 4) these specimens in August 2008. We have no further information regarding this record, nor do we know if other researchers have visited this site with the focus of re-finding *P. albifacies*. Because no details regarding the FLONA Macauã specimens had yet been published, the Comitê Brasileiro de Registros Ornitológicos (CBRO), in their official Lista das aves do Brasil (versão 15/10/2008), relegated *P. albifacies* to their Secondary List of Brazilian birds (J. F. Pacheco pers. comm.). According to CBRO criteria, species on the Secondary List are considered to be of 'probable occurrence in Brazil, provided with specific records published for the country, but whose documental evidence is not known or available.' In this case, the occurrence of *P. albifacies* in Brazil was published in Sigrist (2009), but that source did not indicate if the basis for inclusion was a sight record or a specimen record. The two records of *P. albifacies* documented herein, should now move that species to the Primary List of Brazilian birds.

The strong association between many species of south-west Amazonian birds and bamboos of the genus *Guadua* has been discussed and documented by many workers (e.g. Parker 1982, Pierpont & Fitzpatrick 1983, Terborgh *et al.* 1984, Fitzpatrick & Willard 1990, Kratter 1997). Most of this work has been focused in Peru, although more recently, researchers have documented the occurrence of a similar, but slightly less diverse community of 'bamboo birds' in Bolivia (Parker & Remsen 1987, Alverson *et al.* 2000, Tobias & Seddon 2007, Tobias *et al.* 2008) and Brazil (Parker *et al.* 1997, Zimmer *et al.* 1997, Whittaker & Oren 1999). In Brazil, much of the early focus on bamboo-inhabiting bird communities was directed at south-east Amazonia, in Rondônia, northern Mato Grosso, and southern Pará, where the distribution of *Guadua* is patchier and less extensive than in south-west Amazonia (Parker *et al.* 1997). Investigations directed at these bamboo communities produced numerous significant range extensions for bamboo specialist birds previously thought to be restricted to western Amazonia (Parker *et al.* 1997, Zimmer *et al.* 1997, Aleixo *et al.* 2000). Interestingly, *P. albifacies* is replaced at some of these eastern Amazonian sites by its presumed sister species, Black-and-white Tody-Tyrant *P. capitalis*, which occurs in both bamboo and non-bamboo habitats (Parker *et al.* 1997).

EG, A. Aleixo and M. P. D. Santos have undertaken recent research focused on bamboo-inhabiting birds at several sites in Acre (Guilherme 2001, Tobias *et al.* 2008, Guilherme & Santos 2009), including the UFAC Parque Zoobotânico, where EG has conducted an ongoing, long-term survey initiated in 1998 (Guilherme 2001). These surveys have documented a diverse bamboo avifauna in Acre that includes almost all of the 29 species identified by Stotz *et al.* (1996: 419) as being indicator species of bamboo stands in the Southern Amazonia zoogeographic region; 17 of the 19 species classified by Kratter (1997) as being 'bamboo specialists' along the río Tambopata in dpto. Madre de Díos, Peru; and, the recently described Rufous Twistwing *Cnipodectes superrufus* (Tobias *et al.* 2008, Guilherme & Santos 2009).

The inability of these surveys, and earlier ones (1991, 1992 and 1994–95) by AW along the upper rio Juruá, to find *P. albifacies*, despite their focus on bamboo habitats and the relative abundance of those habitats in the state of Acre, suggests that *P. albifacies* is a genuinely rare and patchily distributed member of Brazil's bamboo avifauna, and not just overlooked. Similarly, Tobias & Seddon (2007) suggested that the species ranges only marginally into Bolivia. Even within the centre of its distribution in south-east Peru, *P. albifacies* is considered 'uncommon and very local' (Fitzpatrick *et al.* 2004). This is in stark contrast to most bamboo specialists, which, at least locally, tend to occur in higher densities than most forest species in Amazonia (pers. obs.). A parallel situation might be found in the case of the Rufous Twistwing, which has a wide, but seemingly patchy distribution in south-west Amazonia (in Peru, Bolivia and Brazil), and which is generally scarce and difficult to relocate at some known sites (Tobias *et al.* 2008). It too, is replaced to the north and east in Amazonia by a more widespread sister species (Brownish Twistwing *Cnipodectes subbrunneus*) that is not restricted to bamboo habitats.

This said, *P. albifacies* is, perhaps, more likely to be overlooked than most bamboo specialists. It is a small flycatcher that spends most of its time in the densely foliaged upper layers of bamboo stands and vine tangles, and its vocalisations, although distinctive once learned, are not particularly loud, and are somewhat similar to those of the more common and widespread Flammulated Pygmy Tyrant *Hemitriccus flammulatus*. Surveys that rely heavily on mist-netting as a sampling technique will likely miss or under-sample *P. albifacies* even when it is present.

Our record of *P. albifacies*, along with the recent discovery of Rufous Twistwing at multiple sites in Acre (Tobias *et al.* 2008, Guilherme & Santos 2009), underscores the need for further investigation and conservation of the diverse bamboo avifauna of Acre, Brazil.

Acknowledgements

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Luís Fábio Silveira, Vitor de Q. Piacentini, Marco Antonio Rego, Marina Somenzari, and the rest of the staff at the MZUSP in São Paulo for their continued assistance in facilitating examination of pertinent specimens from that excellent collection. KJZ & AW particularly thank Barbara & Earl Doolin for providing critical support that made our work in Acre possible.

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Discovery of White-winged Potoo *Nyctibius leucopterus* in Espírito Santo, Brazil, with remarks on its distribution and conservation in the Atlantic Forest

by Thiago V. V. Costa, Christian B. Andretti, Thiago O. Laranjeiras & Gustavo A. B. Rosa

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Summary.—White-winged Potoo *Nyctibius leucopterus* is known from very few localities in the Atlantic Forest, but is supposed to occur throughout suitable habitats in Amazonia. Known solely from specimens until the late 1980s, there are still very few data on its natural history and distribution. Here we report a striking new record of *N. leucopterus* in the Atlantic Forest, at Sooretama Biological Reserve, Espírito Santo, the fourth locality in this biome, the first for south-east Brazil and the southernmost ever. Sooretama, together with the adjacent Linhares Natural Reserve, is the largest fragment of lowland Atlantic Forest. Knowledge of its vocal repertoire and habitat preferences evidently enhance our ability to locate the species, and nutrient-poor, sandier soils are apparently critical to its occurrence in the Atlantic Forest. Should the Amazonian population be described as a separate taxon, as has been suggested in the literature, the Atlantic Forest form will be restricted to fragments in Bahia and Espírito Santo, and thus highly threatened.

White-winged Potoo *Nyctibius leucopterus* is one of the most enigmatic and poorly known of all Neotropical birds. It was described by Maximilian A. Philipp, Prince Wied-Neuwied (Wied 1821) from a female collected near Vitória da Conquista, southern Bahia, Brazil. Until recently, the species was known solely from the holotype and another unsexed specimen with no specific locality data (Cohn-Haft 1993, Cleere 1998, Whitney *et al.* 2003). Two additional historical specimens have recently come to light, supposedly collected in Bahia but without a precise locality (Cleere 2005). Four other old specimens attributed to this species, including a syntype listed by Greenway (1978) and collected in Bahia by Wied, have been re-identified as Common Potoo *N. griseus* (Cohn-Haft 1993, Cleere 2005).

Following its description, *N. leucopterus* went unrecorded for almost two centuries, until the late 1980s, when Cohn-Haft (1993) discovered it north of Manaus, in Amazonian Brazil, *c.*2,500 km from the type locality in the Atlantic Forest. Cohn-Haft (1993) suggested that the Amazonian population may represent an undescribed taxon, based on its notably smaller body size. In addition, he presented much information on behaviour, diet and voice (Cohn-Haft 1993, 1999). Following this, and with knowledge of its voice, *N. leucopterus* has been found at many localities in Amazonian Brazil, as well as in Peru, Guyana, Surinam and French Guiana (Peres & Whittaker 1991, Parker *et al.* 1993, Borges *et al.* 2002, Alvarez & Whitney 2003, Claessens *et al.* 2005, Whittaker *et al.* 2008), and is presumed to be widespread in *terra firme* forest. In contrast, the Atlantic Forest population remained unknown in life until, in 1999, Whitney *et al.* (2003) rediscovered the topotypical population of *N. leucopterus*, *c.*200 km from the type locality, at Una Biological Reserve in southern coastal Bahia. Its voice proved quite similar to Amazonian birds. More recently, *N. leucopterus* was found at the privately owned Estação Veracel, also in Bahia and *c.*100 km south of Una (Carvalho *et al.* 2009). These localities appear to be the only sites in the Atlantic Forest.

Here we report the discovery of *N. leucopterus* in Espírito Santo state, Brazil, the first record for south-east Brazil, the fourth locality for the species in the Atlantic Forest and a range extension of *c.*320 km south.

Study site and Methods

On 4 July 2009, during field work at Sooretama Biological Reserve (hereafter Sooretama), in eastern Espírito Santo (19°03'S, 40°08'W; Figs. 1–2), one of our aims was to search for *N. leucopterus*. Sooretama comprises *c.*24,000 ha of lowland Atlantic Forest, and with the adjacent 21,800-ha Linhares Natural Reserve, owned by the Companhia Vale, forms one of the largest remnants of tropical forest in lowland eastern Brazil (Parker & Goerck 1997), and the largest fragment north of Rio de Janeiro state. It consists of a diverse lowland forest, known as *Floresta de Tabuleiro* (Rizzini 1987, Peixoto & Gentry 1990), associated with sandy soils originated from Tertiary deposits that are deep, acidic and of low fertility (IBDF 1982). Comprising many different formations, in most areas tall forests grow on drier soil with the canopy reaching 40 m, a second arboreal layer and a relatively sparse understorey, and *mussununga* forest, which consists of lower stature trees and herbaceous vegetation on sandier and humid soils. The reserve is surrounded by *Eucalyptus* spp., coffee and papaya plantations, and some private reserves (Marsden *et al.* 2005).

The Sooretama–Linhares complex is critical for bird conservation in the Atlantic Forest (Marsden *et al.* 2005), having been designated an Important Bird Area (IBA) by BirdLife International (Bencke *et al.* 2006). Its known avifauna comprises *c.*300 species, including

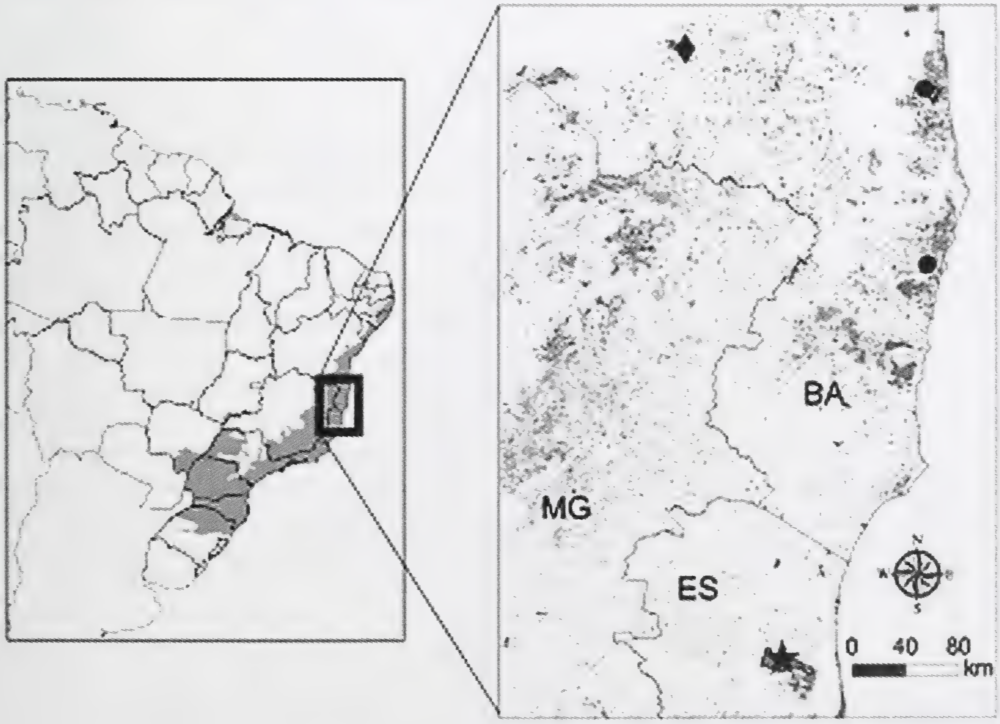

Figure 1. Map showing the Atlantic Forest biome (shaded; left) and Brazilian states of Minas Gerais (MG), Bahia (BA) and Espírito Santo (ES), with recent and historical records of White-winged Potoo *Nyctibius leucopterus* in the Atlantic Forest (right). The diamond marks the type locality at Vitória da Conquista, Bahia, circles other recent records and the star our record at Sooretama Biological Reserve, Espírito Santo.

Figure 2. Quirinão trail, Sooretama Biological Reserve (19°03′S, 40°08′W), Espírito Santo, Brazil (Thiago V. V. Costa)

large raptors such as Black-and-white Hawk-Eagle *Spizaetus melanoleucus*, Harpy Eagle *Harpia harpyja* and Crested Eagle *Morphnus guianensis*, psittacids like Blue-winged Macaw *Primolius maracana*, Red-browed Parrot *Amazona rhodocorytha* and Blue-throated Parakeet *Pyrrhura cruentata*, Banded *Cotinga maculata* and White-winged Cotingas *Xipholena atropurpurea*, and the largest known population of Red-billed Curassow *Crax blumenbachii* (Parker & Goerck 1997, Bencke *et al.* 2006). Furthermore, like other fragments in southern Bahia and central-northern Espírito Santo, it harbours many principally Amazonian taxa, such as White-fronted Nunbird *Monasa morphoeus*, Ringed Woodpecker *Celeus torquatus* and Cinereous Antshrike *Thamnomanes caesius*, suggesting that this region was formerly connected to the Amazonian forest (Willis 1992).

Field work was carried out using binoculars, digital recorders (Sony PCM-D50 and Sound Device) and Sennheiser ME66 microphones, and an iPod and Altec Lansing IM237 speaker for playback. Recordings of *N. leucopterus* used in playback are those presented by Naka *et al.* (2008).

Results

Survey work was undertaken within Sooretama, mainly along the Quirinão trail, from before dusk until 22.00 h. As the moon rose we periodically whistled and performed playback of the song of *N. leucopterus*. Around 19.00 h, with the full moon at *c*.45°, we heard the species' typical call notes (with which we are very familiar in Amazonia), *c*.50 m distant. We were unable to record the calls but persisted to imitate the song. After *c*.15 minutes without response, a potoo-like bird flew silently over us in the canopy, which was *c*.25 m tall with some scattered emergents. Approximately 20 minutes after the first response, and following constant imitation, a bird answered again, and this times its call notes were sound-recorded: a *bweep*, given both perched or in flight (Fig. 3), much like that of nominate Short-tailed Nighthawk *Lurocalis semitorquatus*, but slightly different in frequency and length (pers. obs.). Thereafter, the *N. leucopterus* called repeatedly, including a fast series of call notes, also given by Amazonian birds (pers. obs.). After *c*.15 minutes, it gave the typical song, a long, descending whistle, *feeeooooo*, after which the bird moved away and was silent for *c*.10 minutes, before singing spontaneously *c*.20 m away. The song was heard just twice and could not be sound-recorded.

Remarks

Both the song and call notes match those of the Amazonian population presented by Cohn-Haft (1993) and Claessens *et al.* (2005), and the topotypical form in Bahia (Whitney *et al.* 2003), which appears slightly different in pitch and length. Whitney *et al.* (2003) mentioned that songs recorded at Una show considerable variation between recordings, and are longer than those of Amazonian birds presented by Cohn-Haft (1993). However,

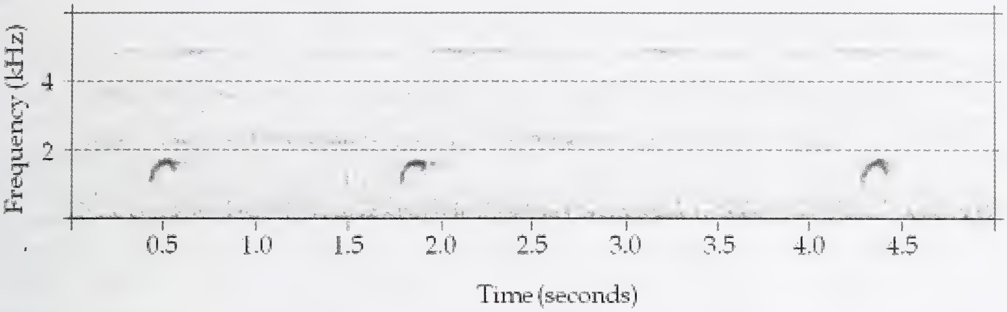

Figure 3. Sonogram of the call notes of White-winged Potoo *Nyctibius leucopterus*, recorded at Sooretama Biological Reserve, Espírito Santo, Brazil, on 4 July 2009, by Thiago V. V. Costa. The recording was made using a Sony PCM-D50 digital recorder and Sennheiser ME66 microphone, and the sonogram created using Adobe Audition 3.0 and Photoshop 7.0.

these comparisons are based on a small sample and the variation could represent an artefact of playback stimulation. Unfortunately, we were unable to compare song length of the Sooretama bird with others, and further recordings are needed to verify the extent of any variation between the two populations.

According to Whitney *et al.* (2003), several attempts to locate White-winged Potoo in southern Bahia and northern Espírito Santo in the 1990s, also using playback or by imitating the Amazonian birds were unsuccessful. These authors do not mention if Sooretama or Linhares were visited during their field work, but A. Whittaker (pers. comm.) has made annual visits (in September–October) since 2002 to Linhares, and G. M. Kirwan (*in litt.* 2010) made annual visits to both Sooretama and Linhares in 1998–2007; both regularly used playback or imitated *N. leucopterus* during nocturnal excursions without success. We were unable to visit other parts of Sooretama, or Linhares, to determine if *N. leucopterus* occurs throughout the entire fragment. However, given that the remnant is continuous, with a homogeneous soil type and appearance to the vegetation, we suppose that the species could occur throughout the complex. If future field work confirms its presence in Linhares, then these reserves will probably support the largest population of *N. leucopterus* in the Atlantic Forest. The complex totals *c.*50,000 ha, i.e. approximately twice the size of other fragments that support the species in Bahia (see Bencke *et al.* 2006). Furthermore, it lies very close to other forest fragments in the municipalities of Aracruz, Jaguaré and Vila Valério, including Comboios Biological Reserve, Goytacazes National Forest and many unprotected areas, together nearly 170,000 ha (Projeto Corredores Ecológicos 2006).

Our confirmed record adds a new species to the well-known avifauna of Espírito Santo (Simon 2009), and brings to four the number of *Nyctibius* in the study area, including Long-tailed *N. aethereus*, Great *N. grandis* and Common Potoos *N. griseus* (http://www.vale.com/hot_sites/linhares/fauna_aves.htm). The last two were also recorded by us. This appears to be the highest number of *Nyctibius* species occurring syntopically in the Atlantic Forest, a phenomenon observed only in suitable parts of Amazonia, where the same four species occur alongside the Amazonian endemic Rufous Potoo *N. bracteatus* (Cohn-Haft *et al.* 1997, Borges *et al.* 2002, Pelletier *et al.* 2005).

The vocalisation of *N. leucopterus* is clearly the best means to locate the species, like other nightbirds. In addition to its nocturnal and canopy-dwelling habits, that this species went unrecorded for >150 years can be explained by the frequency of its song. Like all potoos, it is vocal mostly on moonlight nights, especially at full moon and a few days before (Cohn-Haft 1999; pers. obs.). Particularly in Amazonia, the species apparently seems to be vocal year-round (Claessens *et al.* 2005). However, it sings very erratically and in some situations does not respond to playback for unknown reasons (O. Claessens, T. Deville & A. Renaudier pers. comm.). On the other hand, *N. leucopterus* occasionally responds to playback even in full daylight (Deville *et al.* 2009). Such unpredictable vocal activity contributes to the species going unrecorded. One complication is that the year-round vocal activity observed in Amazonia may not be replicated in the Atlantic Forest, as the more obvious climatic seasons may also lead to definite singing seasons, making the species even harder to detect. During our field work at Sooretama, *N. leucopterus* appeared less aggressive in response to imitations compared to around Manaus (pers. obs.), and also gave call notes more frequently than the song. Despite the warm, clear night, our observation was made in midwinter, when the species might be expected to be less active and not breeding. Thus, the periodicity of singing in the Atlantic Forest requires further assessment.

Concerning habitat preferences, Amazonian birds occur in the canopy of undisturbed lowland *terra firme* growing on deeply weathered clays and in seasonally flooded forest in black-water drainages (Cohn-Haft 1999, Alvarez & Whitney 2003). Whitney *et al.* (2003) also suggested that the species occurs in white-sand forest, although in the Guianan Shield the species is known only from tall *terra firme*. However, in the Atlantic Forest nutrient-poor, sandier soils appear important to *N. leucopterus*, as observed at Una Biological Reserve (Whitney *et al.* 2003) and Sooretama, which forests are structurally very similar. Although principally found in primary forest, it is also known from forest fragments, edges and clearings near Manaus and at Saint-Eugène, French Guiana (pers. obs.; Cohn-Haft 1993, Claessens *et al.* 2005). If we can extrapolate from this, the species may also be less dependent on vast, uninterrupted primary forest in eastern Brazil, as observed in Bahia (e.g. RPPN Estação Veracel).

The geographical spread of records in the Atlantic Forest (Fig. 1) suggests that the species was formerly more widespread in central-northern Espírito Santo and central-southern Bahia than today. However, following the drastic removal of native lowland forest, nowadays any remaining populations of *N. leucopterus* are confined to a few remnant fragments. Our record in Sooretama makes the species' occurrence elsewhere in Espírito Santo fairly possible. Furthermore, its occurrence in suitable habitat in adjacent Minas Gerais also appears plausible. Specific searches for *N. leucopterus* in the Atlantic Forest should concentrate on sandy soil forests, even in small remnants, and knowledge of its vocal repertoire and behaviour is crucial to the species' discovery. More effort is needed to better understand the species' ecology, behaviour and habitat preferences. Following the future description of the Amazonian bird as a new taxon, the Atlantic Forest population will be endemic to Bahia and Espírito Santo, and thus highly threatened.

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A range extension and ecology of Boat-billed Tody-Tyrant *Hemitriccus josephinae* in central Amazonian Brazil

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Summary.—Boat-billed Tody-Tyrant *Hemitriccus josephinae* occurs in north-east South America, but there are large gaps in its distribution and we know little of its natural history. We discovered a small population of *H. josephinae* at the Biological Dynamics of Forest Fragmentation Project (BDFFP), 80 km north of Manaus, Brazil, a range extension of 60 km. In 2007–09, we located five territories at the BDFFP. The species foraged in disturbed areas within mature forest by hopping sideways along small horizontal branches in the subcanopy and by upward-strikes or aerially hawking for insects. We described four vocalisations, two of which have not been previously described. Home range size is between 4.6 ha (minimum convex polygon method) and 5.7 ha (95% kernel density estimate). We provide one of the first ecological descriptions of an Amazonian *Hemitriccus* and comparisons against closely related species should be conducted to understand the complicated phylogenetic relationships of this group.

Although most Neotropical species have been described, we still know little concerning the natural history and distributional details for many species. Small canopy birds are particularly problematic because of difficulties in detecting and accurately identifying them, as exemplified by Boat-billed Tody-Tyrant *Hemitriccus josephinae*, a tiny (9-g) flycatcher of north-east South America; we know little of its natural history other than its general distribution. It is known from Guyana, Surinam, French Guiana and northern Brazil (i.e. the Guianan Shield), although nowhere is it considered common (Donahue 1985, Thiollay 1994, Thiollay 2002, Fitzpatrick 2004, Robbins *et al.* 2007). There is a large gap in its distribution between its regular range in the north-east Guianan Shield and an isolated record from Balbina, Amazonas, Brazil, *c.*140 km north of Manaus (Cohn-Haft *et al.* 1997), leaving us to speculate on the significance of the Balbina record. Around Balbina, the topography is similar to the majority of the Guianan Shield with steep slopes, rocky caves and outcrops, and combisol or orthic ferrasol soils contrasting with the gentle topography and xanthic ferrasol soils of the nearby Manaus region (Sombroek 2000).

Here, we describe the discovery of *H. josephinae* at the Biological Dynamics of Forest Fragmentation Project (BDFFP), 80 km north of Manaus, representing a minor range extension. We also describe aspects of the natural history of this little-known bird, including its foraging behaviour, vocal repertoire and home range size.

Study area

The BDFFP is dominated by *terra firme* lowland forest on clay-rich ferrasols, typical of the region. The forest is typically 30–35 m tall, with emergents reaching 55 m. There are many small streams, some only seasonal, with some topography (at 100–150 m elevation). The area receives *c.*2,500 mm of rain p.a., mainly in January–May, but with annual variation. The site is described in greater detail by Gascon *et al.* (2001).

The BDFFP has a long history of avian research, starting with a mist-netting programme initiated in 1979 to examine the consequences of Amazonian deforestation. Over the following ten years, continuous forest was cleared and converted to agriculture, creating 11 isolated fragments. The farms were mostly abandoned by the early 1990s and these areas are naturally regenerating into secondary forest. The surrounding landscape is still largely undisturbed continuous forest, but the Brazilian state of Amazonas is being deforested rapidly, especially south of the BDFFP as Manaus expands (Fearnside 2005).

In addition to understanding fragmentation affects on the avian community, there has been a continual goal at the BDFFP of describing the avian community as a whole. A species list was first published by Stotz & Bierregaard (1989) followed by Cohn-Haft *et al.* (1997), resulting in 394 species from an area of *c.*50,000 km^2. A four-CD series of recordings of birds from the BDFFP area has also been published (Naka *et al.* 2008).

Discovery of *Hemitriccus josephinae* at the BDFFP

Despite intensive efforts to inventory the avian community at the BDFFP since 1979 (Stotz & Bierregaard 1989, Cohn-Haft *et al.* 1997, Naka *et al.* 2008), *H. josephinae* was not known from the area. In September 2007, we sound-recorded an unknown *Hemitriccus* near a camp in continuous forest (km 37); the call was clearly unlike the only congener present at the BDFFP, White-eyed Tody-Tyrant *H. zosterops*. Almost simultaneously a pair of *H. josephinae* was fortuitously captured and colour-banded *c.*40 km to the west, in a 10-ha forest fragment (BDFFP fragment 2206; Fig. 1). Identification of the mystery *Hemitriccus* at km 37 was soon confirmed as *H. josephinae* by comparing vocalisations to those of the colour-banded birds. Not only do these observations represent a *c.*60 km range extension to the south-west, they are the first away from the rocky slopes typical of the Guianan Shield and Balbina area.

H. josephinae is immediately distinguished from *H. zosterops* by chestnut-red, not creamy-white, irides. *H. josephinae* also lacks pale yellow fringes to the greater and median coverts and has more extensive grey on the face compared to *H. zosterops*. The tarsus of *H. josephinae* is peculiarly covered in nodules, which are lacking in *H. zosterops* (Fig. 1). We took measurements from the pair of captured *H. josephinae*; one was distinctly larger

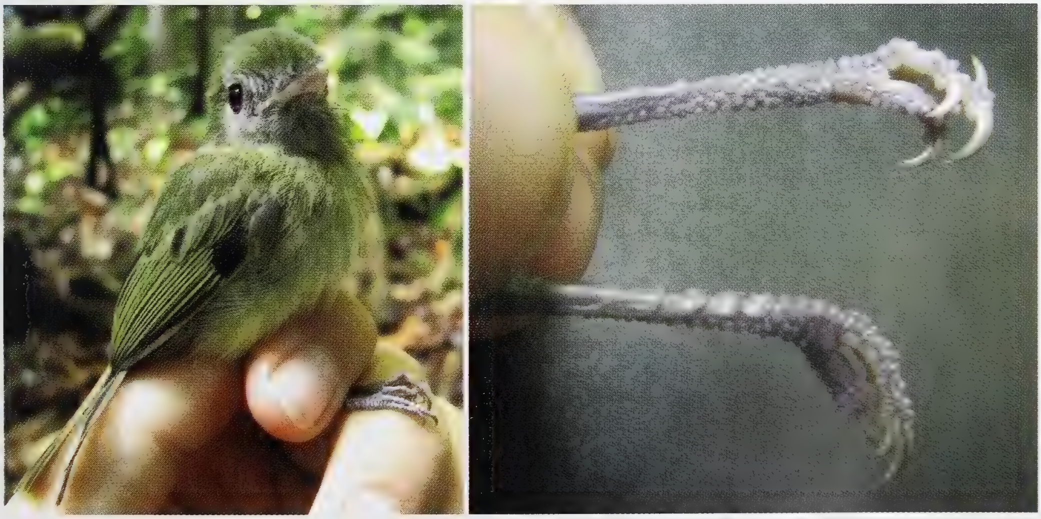

Figure 1. Boat-billed Tody-Tyrant *Hemitriccus josephinae* (and its noduled tarsi), near Manaus, Brazil (E. I. Johnson)

than the other in wing-chord, tail length and mass, with the larger probably a male as in other tody-tyrants (M. Cohn-Haft pers. comm.). We made repeated monthly visits to the 10-ha fragment through December 2007 and again in June–July 2009 to make behavioural observations and understand the spatial use of this colour-banded pair. We also confirmed their continued presence during brief visits in 2008. When we returned in 2009, one of the colour-banded individuals could not be located and an unbanded bird was paired with the presumed female.

In June–November 2008, we surveyed four 100-ha plots within continuous forest and recorded the presence or absence of this species. It was absent from three of these plots, but present in the fourth, *c.*500 m from the km 37 camp. We located three territories in the 100 ha, while the original territory found in 2007 near the camp *c.*500 m south-west of the plot was still occupied. The km 37 area was not surveyed by previous avian inventories (e.g. Stotz & Bierregaard 1992, Cohn-Haft *et al.* 1997) and the extremely patchy distribution of *H. josephinae* at the BDFFP may explain why the species was previously overlooked, although we cannot eliminate the possibility of recent colonisation. Below, we describe the vocalisations, home range size, and the foraging behaviour of *H. josephinae* at the BDFFP.

Foraging behaviour.—At the PDBFF, *H. josephinae* mainly forages in the subcanopy 10–20 m above ground. The five territories were in dense tangles in somewhat disturbed mature forest on steep slopes (n=2), flat seasonally flooded depressions (n=1), or heavily wind-damaged areas (n=2), but many seemingly suitable patches of disturbed forest were unoccupied. *H. josephinae* has a distinctive foraging behaviour that it does not share with *H. zosterops*, Double-banded Pygmy Tyrant *Lophotriccus vitiosus* or Helmeted Pygmy Tyrant *L. galeatus*. Most notably, it hops sideways along small horizontal branches, regularly spinning 180°, continuing to hop while scanning for invertebrates (P. Benham pers. comm.). It examines nearby leaf clusters for insects and makes frequent short (<3 m) upward-strikes (*sensu* Fitzpatrick 1980) to take insects off branches or leaves, or occasionally flushed or flying insects on the wing. It often spends several minutes in the subcanopy of a single canopy tree before moving to the next tree. We never observed pairs foraging in the same tree.

Vocalisations.—We recorded 25.2 minutes of *H. josephinae* vocalisations. *H. josephinae* does not call as part of the dawn chorus (± 30 minutes of sunrise); it often did not begin to vocalise until *c.*1 hour after sunrise. Otherwise, the species calls at any hour of the day, but again less near sunset. It also did not call during periods of heavy insect noise, which would drown out its relatively weak voice.

Donahue (1985) described the call as a falling *pic-pic-pic*, but did not indicate the context of this call. This also oversimplifies the vocal repertoire of *H. josephinae*; we describe four vocalisation types. The first (type I) is a single short *pic* with a 4.4 ± 0.2 seconds (mean ± SE) pause between *pic* notes. This call was given repeatedly, sometimes lasting at least five minutes. The single *pic* was the most frequently given call, representing 80% of all call notes recorded (n=280). The second call (type II), representing 17% of all calls, was similar in frequency and length to the first call and is that described by Donahue (1985), but it was doubled or tripled with the first note being slightly higher in pitch than the subsequent note or notes (Fig. 2a). A third call (type III), representing 3% of all calls, involved 4–5 *pic* notes given in rapid succession, all different in pitch with the second note the highest and the following 2–3 notes consecutively descending (Fig. 2b). Type II and III vocalisations were seemingly randomly inserted within a series of type I calls, but with a 9.4 ± 0.7 seconds (mean ± SE) pause before the next call. Pauses after type II and III calls were significantly longer than pauses after type I calls (t-test, $t = 8.85$, $P < 0.001$; Fig. 3). A fourth vocalisation (type IV) was rarely given and we were unable to sound-record it; we describe it as a rapid

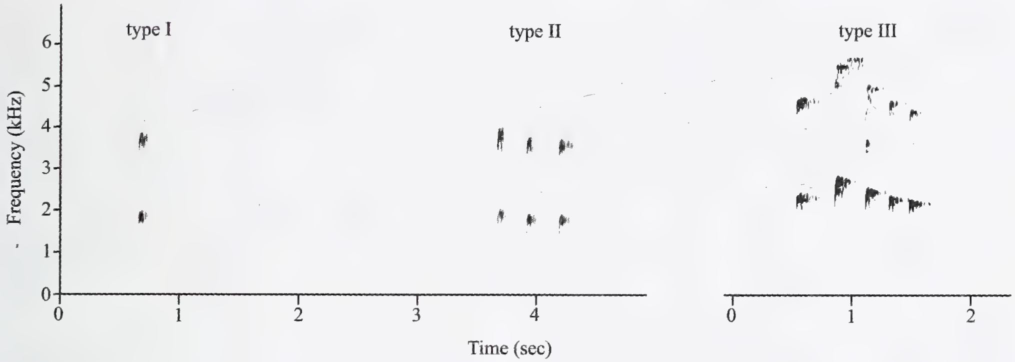

Figure 2. Sonograms of type I, II (a), and III (b) calls given by Boat-billed Tody-Tyrant *Hemitriccus josephinae* near Manaus, Brazil. Note that the type III call has considerable foliage-related reflectance, but that each note is shaped as in type I and II calls. Recordings were made using a Song TCM-5000V and Sennheiser ME-66 microphone (a) and using a Canon G2 digital camera in video mode with the sound file extracted using VirtualDub 1.6.19 (www.virtualdub.org; b). Sonograms were prepared using Raven Pro 1.4 (Cornell Lab of Ornithology, Ithaca).

swelling and then descending series of 7–15 quick *pic* notes similar in quality to other call notes. To our knowledge, type III and IV vocalisations have not been previously described.

The context of these calls is still unknown, although type I, II and III vocalisations may serve as contact calls between foraging individuals rather than for territory maintenance. These vocalisations were also not given at dawn, supporting the hypothesis that these are contact calls. Only one bird of each pair would give a type I, II or III call, while the other remained silent; both sexes made these vocalisations, but never simultaneously. Vocalisations were regularly given while foraging and did not appear to interrupt this activity. The pair did not forage together (e.g. in the same tree), but when both birds were occasionally located, the silent individual was usually at a lower strata <100 m away. A pair was once observed 150 m apart when the pair members took turns alternating between a call series and an interval of silence. The type IV vocalisation may be the true song but, because it was so rarely given, we do not yet understand its significance. One reason it may be infrequently given is because neighbours in continuous forest were separated by >200 m, i.e. beyond the range where vocalisations were audible to us; thus, counter-singing is probably not regular between neighbours due to their patchy distribution. This vocal behaviour is similar to other Amazonian flycatchers, including some *Tolmomyias* and *Lophotriccus* spp., where call notes are frequently repeated throughout the day, but the true song is rarely and seemingly randomly inserted into long periods of calling (K. J. Zimmer *in litt.* 2010). Although it is possible that we overlooked the true song, we have an intimate knowledge of the vocalisations of the bird community at the BDFFP, such that an unfamiliar song would be readily apparent, especially near known *H. josephinae* territories.

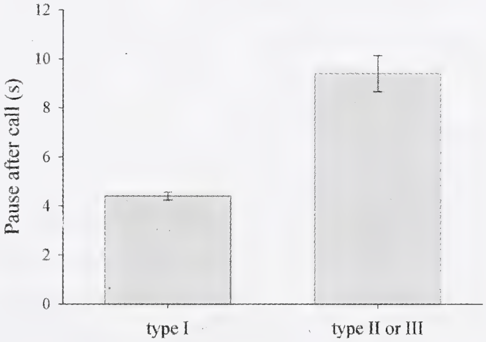

Figure 3. The pause length after type I (n=224) and type II or III (n=47) vocalisations by Boat-billed Tody-Tyrant *Hemitriccus josephinae* near Manaus, Brazil.

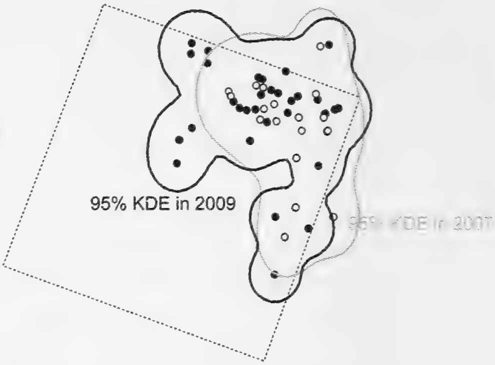

Figure 4. Home range estimates for *H. josephinae* based on 95% kernel density estimates (KDE) using spot-mapped points in a 10-ha fragment (dotted black line indicating the border) in 2007 (grey) and 2009 (black) near Manaus, Brazil.

Home range size and stability.—To estimate home range use, we spot-mapped the territory in the 10-ha fragment. We did not spot-map territories in the continuous forest plot because parallel trails were 200 m apart and lacked perpendicular trails, limiting our ability to effectively spot-map species with weak voices like *H. josephinae*. In the 10-ha plot, however, parallel trails were 80–100 m apart with cross trails every 160 m. Our general impression of home range use in continuous forest was that it was consistent with our estimates from the 10-ha fragment.

We used a 95% fixed kernel density estimator (KDE) to construct a utilisation distribution (UD) based on spot-mapped points to estimate the home range size of the pair in the 10-ha fragment using Home Range Tools for ArcGIS (Rodgers *et al.* 2007). We chose a fixed KDE because it generates less biased estimates than adaptive KDEs in simulation evaluations (Seaman & Powell 1996). We used the Gaussian (bivariate normal) kernel form with least-squares cross-validation to automate bandwidth selection ('smoothing'). We chose kernels with a grid cell resolution of 10 m. Contouring was performed by volume and we used a scaling factor of 1,000,000 to rescale home ranges to unit variance. We also calculated minimum convex polygons (MCP) for each year separately and combined. We spot-mapped 19 points in 2007 and 32 in 2009 and estimated home range size for each year separately as well as pooled.

The territory in the 10-ha forest fragment was occupied at least in 2007–09, even though one bird (probably the male) emigrated or died during this time; he was replaced by an unbanded bird. The 95% KDE estimated home range use to be 4.9 ha in 2007 and 6.0 ha in 2009 (Fig. 4). The shape of the territories was highly similar between years so we combined the points from the two years to give a 5.7 ha home range. The MCP around points collected was 2.0 ha in 2007, 4.4 ha in 2009, 4.6 ha for both years combined. This pair nearly exclusively used the inside of the forest fragment and only three of 51 (6%) observations came from surrounding second growth.

Discussion

H. josephinae is a poorly known forest bird apparently restricted to the Guianan Shield by the rios Negro and Branco to the west and rio Amazonas to the south. It usually occurs in disturbed areas of humid forest and is associated with rocky slopes in dense midstorey or subcanopy vegetation where the canopy is reduced in stature (Ridgely & Tudor 1994). Robbins *et al.* (2007) found it in seasonally flooded forest and forest edge in southern Guyana, but not in *terra firme* forest. We discovered five territories at the BDFFP in *terra firme*, including three in a 100-ha continuous forest plot. This suggests that the species may be regular, although highly patchy, further south into the central Amazon basin than previously expected and may occasionally occupy other *terra firme* forests across the Guianan Shield.

Our MCP home range size estimate of 4.6 ha for *H. josephinae* is fairly small compared to other Amazonian forest species (Terborgh *et al.* 1990, Stouffer 2007; EIJ unpubl.), but it is consistent with estimates from other closely related tyrant flycatchers. Terborgh *et al.* (1990) reported home range sizes, based on spot-mapped MCP estimates, to be 3.0 ha in Short-tailed Pygmy Tyrant *Myiornis ecaudatus* and White-bellied Tody-Tyrant *Hemitriccus griseipectus*, and 7.0 in Yellow-browed Tody-Flycatcher *Todirostrum chrysocrotaphum* in Cocha Cashu, Peru. Based on spot-mapping and MCP estimates at the BDFFP, *Lophotriccus vitiosus* has a home range of 3.8 ha and *H. zosterops* a home range of 3.9 ha (EIJ unpubl.). We estimated the home range of *H. josephinae* to be 5.7 ha using a 95% KDE or 4.6 ha using a MCP from 51 points. Barg *et al.* (2005) suggested that a sample of 100–150 points may be required to find congruence between MCP and KDE estimates, suggesting that true home range size is somewhere between the 4.6 ha MCP estimate and 5.7 ha KDE estimate.

The genus *Hemitriccus* forms part of a poorly understood (ecologically and taxonomically) group of birds called 'tody-tyrants' (subfamily Todirostrinae *sensu* Tello *et al.* 2009), which includes *Todirostrum*, *Poecilotriccus*, *Lophotriccus*, *Atalotriccus*, *Myiornis* and *Oncostoma* (Lanyon 1988, Cohn-Haft 2000, Tello & Bates 2007, Tello *et al.* 2009). Although the tody-tyrant clade is monophyletic, *Hemitriccus* is not (Tello & Bates 2007). *H. josephinae* was previously placed in its own genus, *Microcochlearius* (e.g. Meyer de Schauensee 1970), because of its unique morphologic features including the broad bill and rounded tail. It was briefly merged with *Idioptilon* based on shared plumage affinities (Fitzpatrick 1976), which genus was subsequently named *Hemitriccus* according to nomenclatural rules (Traylor 1977). The taxonomic placement of *H. josephinae* remains unclear as it was not included in recent species-level phylogenies based on morphological and genetic characters of tody-tyrants (Lanyon 1988, Tello & Bates 2007).

H. josephinae is unique among *Hemitriccus* in several respects. First, it is the most north-eastern *Hemtriccus* in Amazonia. While other *Hemitriccus* occur in the Guianan Shield, *H. josephinae* is the only species endemic to this region (Thiollay 1994, Fitzpatrick 2004). Second, its foraging behaviour of hopping sideways along subcanopy horizontal branches is unique among *Hemitriccus* to our knowledge. Third, its bill is broader than other *Hemitriccus*, although not to the degree of the closely allied flatbills. It appears to use this bill by occasionally sallying to flying insects, perhaps more so than other tody-tyrants which typically upward-strike their prey (Fitzpatrick 1980, Gabriel & Pizo 2005). Fourth, its noduled tarsi appear to be unique among *Hemitriccus* and the tody-tyrant clade. Finally, its vocalisations, based entirely on variations in the pitch and regularity of clear *pic* notes, are relatively simple compared to buzzy notes given by many other tody-tyrants (Cohn-Haft *et al.* 1997, Cohn-Haft 2000). Although none of these characters alone are evidence for its taxonomic placement, they warrant a closer examination of its relationship with other tody-tyrants.

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House Sparrows *Passer domesticus* in Japan

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SUMMARY.—House Sparrow *Passer domesticus* was recorded for the first time in Japan in 1990 on Rishiri Island, Hokkaido. Following this, further records were reported in four (possibly five) other areas, involving a total of eight sites, until 1994, with possible earlier sightings dating from 1988. The initial sightings were of singles (though two males were later suspected at two sites) and no young were found, though hybridisation with Eurasian Tree Sparrows *P. montanus* occurred at five sites. We suggest that the House Sparrows were probably windblown from the Far Eastern Federal District of Russia by an exceptional climatic event. It seems that colonisation of Japan by House Sparrow is unlikely.

House Sparrow *Passer domesticus* has an extensive natural range that extends from coastal Western Europe and North Africa to Asia, as far east as Singapore in the south (colonised only in 1997), and the coast of the Far Eastern Federal District of Russia in the north. In the last-named region, it reached Nikolayevsk-na-Amure (53°08′N, 140°48′E) at the mouth of the Amur River in 1929 by following the Trans-Siberian railway during its construction. From there it spread to Okha (53°33′N, 143°01′E) on Sakhalin. More recently, the species has become established in many coastal towns from Magadan (59°38′N, 151°00′E) to Provideniya (64°31′N, 173°24′W) in the extreme north-east, through human introduction, and from there has spread, probably unassisted, across the Bering Strait to Alaska in the 21st century. House Sparrow, despite its recent decline in parts of Europe, is a dynamic species and the introduced populations in South America and sub-Saharan Africa are still extending their ranges.

More surprising have been the reports of its occurrence in Japan at the end of the 20th century. This paper reviews the available data and speculates on the provenance of these birds.

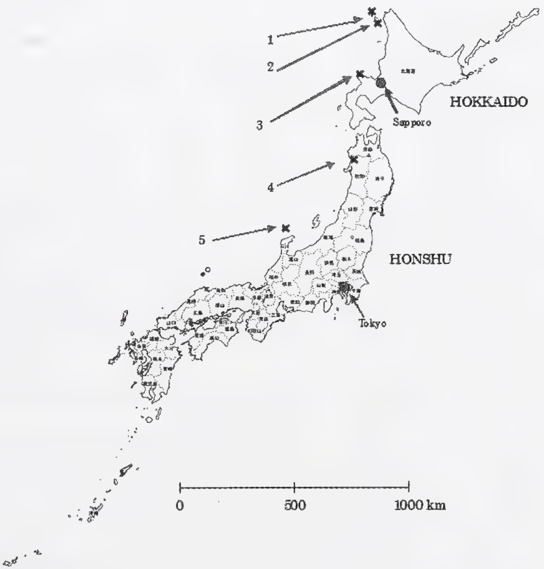

Figure 1. Map of Japan showing locations of the occurrences of House Sparrow *Passer domesticus* in the period 1990–94. 1. Rebun Island (1992), 2. Rishiri Island (1990–92), 3. Raikishi (1992), 4. Hachimori-cho (1994), 5. Hegura Island (1994).

The data

The first record of a House Sparrow in Japan was a male at Oshi-domari on Rishiri Island, off the north-west coast of Hokkaido, on 4 August 1990 (Sano 1990). This record was published in the press (*Hokkaido Shinbun* 30 May 1992), creating a wave of interest that produced several further records, both from M. Sano, who has been studying the species for many years, and other birdwatchers and members of the public. Eurasian Tree Sparrow *Passer montanus* is common in Japan and, moreover, through appearing in many paintings and folk tales, is extremely well known. Because of its familiarity in Japan, the 'strange' sparrows that were reported before the sighting by Sano were unlikely to be that species and are more likely to have been the unfamiliar House Sparrow. The initial report was followed by records at seven other locations, with photographic evidence available from four of these: Oshi-domari (M. Sano), Oniwaki (S. Murikama), Raikishi (Ms R. Satō) and Hegura Island (M. Arai & Y. Watanabe). These sightings have involved both sexes, though not in the same location, and hybrids. Hybrids between House and Eurasian Tree Sparrows are not uncommon. Seventy-three records in Europe were analysed by Cordero & Summers-Smith (1993); the result was consistent with the 'mate restriction hypothesis'; that is when one (or both) of the species is rare, independent of the sex of that individual, hybridisation is likely to occur. This was evidently the situation with the House Sparrows that arrived in Japan.

The general areas of occurrence are shown in Fig. 1. The precise locations on Rebun Island (2) and Rishiri Island (3) cannot be shown on the scale of the map, but the sightings are sufficiently far apart to suggest that they probably involved separate individuals of this highly sedentary species.

1a. Rebun Island, Hokkaido: Kafuka (45°17′N, 141°02′E). A 'strange' sparrow was seen at Kafuka in the south of the island in 1989–91. A hybrid was reported there on 1 August 1992 (Sano 1992a).

1b. Rebun Island, Hokkaido: Funa-domari (45°26′N, 141°02′E). Three hybrids were reported on 1 August 1992 (Sano 1992a). Funa-domari is 10 km from Kafuka. The fact that the birds were seen on the same day suggests that these records refer to separate broods.

2a. Rishiri Island, Hokkaido: Oshi-domari (45°14′N, 141°13′E). A 'strange' sparrow was seen in 1988 and 1989. On 4 August 1990, a male House Sparrow with two hybrid young was seen and photographed. Two males were seen on 9 November 1991, four on 2 May 1992 and five on 30 July 1992. It is unclear how many of these were House Sparrows and how many were hybrids, but some that were photographed were clearly the latter (Sano 2005).

2b. Rishiri Island, Hokkaido: Oniwaki (45°08′N, 141°18′E). An adult male was first seen in August 1991 and on several occasions until 9 November 1991. In 1992, a male House Sparrow, presumed to be the same bird, was seen mating with a Eurasian Tree Sparrow on 22 April 1992 and again on 4 May 1992, both incidents being photographed. The last record was a female, presumably a hybrid, on 30 July 1992 (Sano 1992a,b).

2c. Rishiri Island, Hokkaido: Kutsu-gata (45°11′N, 141°07′E). An adult male was seen by a local observer on 30 July 1992, the identification being confirmed later by Sano (1992a). Oniwaki is 15 km from Oshi-domari, Kutsu-gata 11 km from Oshi-domari and 16 km from Oniwaki. These records are considered to refer to different individuals.

3. Raikishi, Hokkaido (43°19′N, 140°24′E). An adult male House Sparrow was photographed (by Ms R. Satō) in 1992—possibly two male House Sparrows were present. A male House Sparrow was seen mating with a Eurasian Tree Sparrow at the end of May 1992; hybrid young were seen in September 1992 (Sano 1992a).

4. Hachimori-cho, Honshu (40°20′N, 140°20′E). A female House Sparrow was reported in August–September 1992 (Sano 2005).

5. **Hegura Island, Honshu** (37°52′N, 136°56′E). A female House Sparrow seen and photographed on 22 May 1994 was in the same area in June (Sano 2005). There was no possibility of breeding as there are no Eurasian Tree Sparrows on Hegura.

All of these locations are shown in Fig. 1. All are on the west coast of Japan and extend over 900 km. In addition to the above, there is an unconfirmed record for Niigata Prefecture for 1994 (Yomiuri Shinbun 9 June 1994). Niigata Prefecture is due east of Hegura.

Discussion

Sano (1992a) originally suspected that the birds had spread from Sakhalin—Rishiri Island is only *c*.40 km from the southern tip of Sakhalin—but this hypothesis was abandoned when he found that, although House Sparrows are still in Okha, there had been no spread to the south. An alternative that he suggested was that the birds had flown from the Far Eastern Federal District of Russia assisted by the autumn monsoon; a distance of *c*.250 km to north Hokkaido and *c*.350 to the Shakotan Peninsula, where Raikishi is located. Another possibility is that the birds could have hitched lifts on ships from the Far Eastern Federal District—there is considerable maritime traffic between there and Japan. With the records of House Sparrows (as distinct from hybrids) restricted to a limited period, within the lifespan of the species in the wild, this seems unlikely. If these birds had come aboard ships, why has there been a complete absence of records outside this period? It seems more probable that there was an extraordinary climatic event that caught up some House Sparrows from Russia and of these a small number, probably 5–8 males and two females, 'rained' down on Japan. Such scattered birds are unlikely to find a mate of their own species and can only breed with Eurasian Tree Sparrows giving rise to hybrids, as was observed. Consequently, there is no way that a population of House Sparrows would become established. Hybrids, even if viable, are likely to be less well adapted than the parent species and will disappear unless the 'invading' species is reinforced by new arrivals. Eurasian Tree Sparrows successfully colonised Gran Canaria in 1989, despite the presence of Spanish Sparrows *Passer hispaniolensis* (Trujillo *et al.* 1991), whereas a group of House Sparrows that arrived on the same island in 1998 hybridised with the Spanish Sparrows and traces of them soon disappeared by being absorbed into the population of the latter through hybridisation (Anon 1998; T. Clarke *in litt.* 1999). Both these invasions are thought to have been ship-assisted. It may largely be a matter of chance in such cases if a breeding population becomes established, though House and Spanish Sparrows are very closely related and likely to interbreed. There have been eight records of Spanish Sparrows in the UK in the last 100 years (unsurprisingly all males—females are difficult to separate in the field from House Sparrows), but only two records of hybrids, one each with House Sparrow and Tree Sparrow (Summers-Smith 2007). It seems most likely that these involved female Spanish Sparrows that were not detected.

Conclusion

It seems most probable that the Japanese records involved a freak event, or series of freak events, and that colonisation of Japan by House Sparrows is unlikely to occur in the near future.

Acknowledgements

Grateful thanks to Masao Sano, who has been studying Eurasian Tree Sparrows for nearly 50 years in Japan, for his help in providing copies of his papers and newspaper cuttings relevant to the occurrence of House Sparrows in Japan; also for the trouble he has taken in response to our frequent questions for additional information. Without his dedicated personal efforts, we would have been unable to build up this picture of the presence in Japan of House Sparrows in the early 1990s. We are grateful to M. A. Brazil, R. Kurosawa and D. T. Parkin, who reviewed the original manuscript, and G. M. Kirwan, for their constructive comments.

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New taxa and new records of birds from the north coastal ranges of New Guinea

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Summary.—We report the ornithological results of field trips in 2005 and 2007 to the Foja Mountains of Indonesian New Guinea. Our subsequent analysis of the avifauna of this little-studied and isolated mountain group in the context of the biogeography of New Guinea's north coastal ranges produced the following results: (1) a new subspecies of the mouse-warbler *Crateroscelis robusta* from the Foja Mountains; (2) evidence that *C. robusta* exhibits sufficient geographic variation to warrant subdivision into two or more allospecies; (3) a distinctive new subspecies of the Goldenface *Pachycare flavogriseum* from the northern ranges of Papua New Guinea; (4) conclusive evidence that the 'lost' bird of paradise, *Parotia berlepschi*, inhabits the Foja Mountains; and (5) several additional taxonomic and distributional records for the Foja Mountains.

New Guinea is the largest, highest and biologically richest tropical island. Its array of mountain ranges has promoted both avian speciation and subspecific differentiation that has been delineated and documented over the last century (Salvadori 1880–82, Mayr 1941, Rand & Gilliard 1967, Diamond 1972, Beehler & Finch 1985, Coates 1985, 1990, Beehler *et al.* 1986). Ernst Mayr's deployment of compelling examples of geographic differentiation and speciation of birds (e.g., *Paradisaea, Melidectes*) in the New Guinea region have become enshrined in the evolutionary literature (*cf.* Mayr 1942, 1963, 1970).

The outlying ranges of New Guinea remain one of the last frontiers of ornithological exploration, as evidenced by Diamond's various discoveries (Diamond 1969, 1982, 1985) and those announced by an international team that explored the Foja Mountains of western (Indonesian) New Guinea (Beehler 2006, Beehler *et al.* 2006), which are discussed here in greater detail. Diamond (1985) reviewed many interesting aspects of New Guinea's 15 outlying mountain ranges, and set the stage for follow-up field and museum studies. Of particular interest are those isolated northern ranges that include, from west to east, the Van Rees, Foja, Cyclops, Bewani, and Torricelli ranges—extending from northern Papua into north-western Papua New Guinea (hereafter PNG) (Fig. 1). Certain montane forms have differentiated in these northern ranges, but the examples of differentiation follow no set geographic pattern, and were subsequently termed 'checkerboard allopatry' by Diamond (1972).

Here, we report the taxonomic results of two biodiversity-focused field trips to the Foja Mountains of western New Guinea in 2005 and 2007. These trips were the long-delayed result of the inspiration generated by Diamond's 1979 discovery of the haunts of the 'lost' Golden-fronted Bowerbird *Amblyornis flavifrons*—described in 1896 by Lord Rothschild from trade skins taken at an unknown locality in western New Guinea (Diamond 1982, 1985). Following the announcement of Diamond's discovery, BMB made plans to return to the Foja Mountains (= Gauttier or Foya Mountains). These were delayed 18 years, during which BMB undertook three over-flights and selected a possible helicopter-landing site in the interior uplands. Meanwhile, Conservation International (CI) established a programme in the Mamberamo Basin, constructing a field base at Kwerba, a village in the

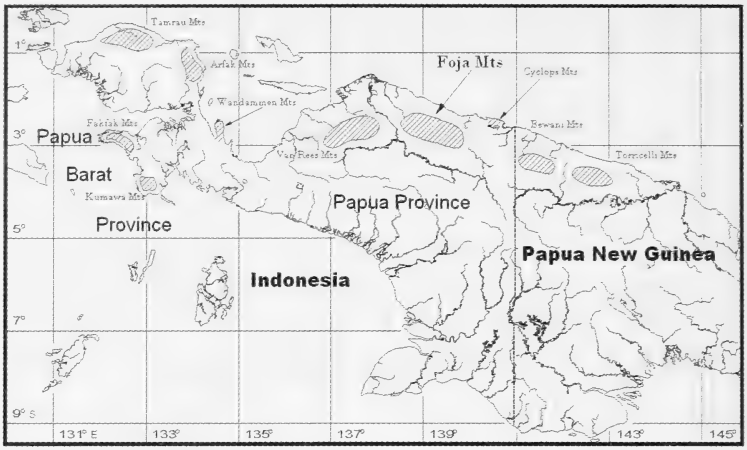

Figure 1. Locator map for the Foja Mountains and other outlying mountain ranges in central and western New Guinea.

western foothills of the Fojas (Fig. 1). Repeated discussions by CI staff with village leaders in Kwerba and nearby Papasena finally produced assent from the local communities for an expedition into the mountains—a critical hurdle in the process. This was followed by the signing of a memorandum of agreement between CI and the Research Center for Biology of the Indonesian Institute of Sciences (LIPI) in 2004, formalising a partnership for field research. Official permission was granted in mid 2005. A Conservation International Rapid Assessment (CI-RAP) field team was then assembled, comprising international and Indonesian scientists, and a plan was developed to get field teams into the foothills by foot and the interior uplands via helicopter. The expedition was successfully rolled out in November–December 2005 (Beehler 2006).

Considerable publicity surrounding the findings of the 2005 expedition provided an opportunity to return to the Foja Mountains in June 2007 with a film crew. This provided an additional opportunity for BMB and an Indonesian vertebrate zoologist to collect further data on the birds and mammals of the Foja uplands.

Field work and study sites

2005 The CI-RAP team arrived at the Kwerba village base camp (70 m) on 15 November 2005. One segment of the 14-person scientific crew was tasked to survey the hill forest on foot and the second was assigned the highlands, to be accessed by helicopter. The montane team landed at the Bog Camp (1,652 m) on 22 November and remained until 7 December 2005. This team operated from a single camp at the Bog, but visited forests at 1,200–1,900 m via trails established by the team. During this period, the hill forest team surveyed from Kwerba to Hotice Camp in riverine forest at 700 m with a field ornithologist (Neville Kemp) conducting bird surveys to 750 m above Hotice Camp.

2007 The joint CBS-film / CI-science team arrived at Papasena village base camp on 14 June and at the Bog Camp by helicopter on 15 June, remaining until 25 June. All field work was conducted within 2 km of the Bog Camp.

Methods

Birds were surveyed by sight, sound and mist-net. In a few instances, the Kwerba hunters brought birds that they had shot with bow-and-arrow (one woodcock, two forest rails and one mouse-warbler). A network of *c*.10 km of trails was cut by the team for observing and sampling plants and animals. These were surveyed at various hours of the day and night. Mist-nets were operated day and night. Bird vocalisations were recorded using a shotgun microphone and a digital mini-disc player recording onto high-MD disks, the results of which have been deposited at the Macaulay Library of Natural Sounds (Cornell Lab of Ornithology, Ithaca, NY). Finally, 98 specimens were taken (31 as study skins, the rest as whole anatomical specimens), all deposited at the Museum Zoologicum Bogoriense (now at Cibinong). The study skins were studied in the Cibinong collection as well as at the American Museum of Natural History (AMNH), New York, making direct comparison with relevant available material at those institutions. We discuss certain montane species of taxonomic and distributional interest below.

Species accounts

MAYR'S FOREST RAIL *Rallicula mayri carmichaeli*

Specimen data.—Adult male, 3 December 2005, Bog Camp, weight 133 g, wing chord 102 mm, wing arc 109 mm, iris dark brown; adult female, 27 November 2005, Bog Camp, weight 108 g, wing chord 97 mm, wing arc 104 mm, iris dark brown.

Diamond (1985: 69) encountered this species in the Fojas but was unable to collect it. We collected a male and a female, which are closest to the population from the north coastal range of PNG (*R. m. carmichaeli*) in having a dull dark chestnut head, crown, nape and mantle. Furthermore, both *R. m. carmichaeli* and the Foja birds lack barring on the upper tail, which is present on the type of *R. m. mayri*. Given the relatively few specimens available of *R. mayri* and the rather considerable variation in part related to sexual dimorphism and perhaps also to age, it is difficult to definitively diagnose races within the species. The Foja female is distinct in having abundant bright dorsal spotting. Geographically (Fig. 1), the Foja Mountains are closer to the Cyclops Mountains than to the Bewani and Torricelli Mountains of PNG and yet the Foja birds are morphologically closest to the more distant population, an example of checkerboard allopatry (Diamond 1972).

Diamond (1969, 1985) described *Rallicula* populations in detail, and made clear that the distinction between *R. mayri* and *R. forbesi* is subtle—their plumage and morphology are quite similar. Given that these geographic isolates are behaviourally similar, similar in vocalisation, and allopatric, it could be argued to combine *mayri* and *forbesi* into a single polytypic species.

The Foja form is a fairly common terrestrial inhabitant of mid-montane forest interior. It was easily observed and vocal. The field team obtained photographs of a single adult female alive in the hand in 2007.

LITTLE RED LORIKEET *Charmosyna pulchella rothschildi*

One was mist-netted under a flowering tree in the forest interior (female, ova small, weight 32 g, wing chord 93 mm, iris dull orange). The presence of a green band across the breast indicates this population is closest to *C. p. rothschildi,* which has been recorded from the Cyclops Mountains and the northern slopes of the central cordillera.

MOUNTAIN MOUSE-WARBLER *Crateroscelis robusta*

A distinct population of Mountain Mouse-Warbler was found at the Bog Camp of the Foja Mountains in 2007 and is described here as a new subspecies.

Crateroscelis robusta diamondi, subsp. nov.

Holotype.—Adult male, Museum Zoologicum Bogoriense (MZB) no. 30.692, Beehler field number (BBFM) 46. Mist-netted in forest at the Bog Camp, Foja Mountains, Sarmi District, Papua, Indonesia, at 1,652 m (02°34′22″S, 138°43′02″E) on 27 November 2005. The holotype is, by plumage, an adult male and also had a testis measuring 4 × 5 mm. Iris: rich red; bill: in dried specimen dark brown with paler horn base to mandible; leg colour: dull brown in dried specimen. Measurements: weight 15 g, wing chord 63 mm, wing arc 65 mm, tail 37.1 mm, tarsus 28.5 mm, bill from base 17.2 mm. Specimen prepared by BMB.

Distribution.—Known only from the type locality, but presumed to range through the uplands of the Foja Mountains and might also be expected in the adjacent Van Rees Mountains.

Additional specimens.—26 November 2005, MZB 30.693 (BBFM 29) adult male, testis 4 × 6 mm, weight 13.8 g, wing chord 63.5 mm, wing arc 65.0 mm, tail 37.2 mm, tarsus 28.5 mm, bill from base 17.2 mm, iris red; 26 November 2005, MZB 30.691 (BBFM 36) adult (unsexed), weight 15.2 g, wing chord 67 mm, wing arc 69 mm, tail 37.31 mm, tarsus 28.80 mm, bill from base 17.5 mm; [spirit specimens] 24 November 2005, BBFM 04 (MZB 30.737) shot by arrow, unsexed, weight 14.5 g, wing chord 58.0 mm, wing arc 61.0 mm, tail 37.2 mm, tarsus 28.2 mm, bill from base 15.0 mm, iris dark brown; 27 November 2005, BBFM 41 (MZB 30.745) unsexed, weight 15.5 g, wing chord 58.5 mm, wing arc 61.0 mm, tail 37.35 mm, tarsus 28.6 mm, bill from base 16.6 mm, iris dark brown; 28 November 2005, BBFM 58 (MZB 30.729) adult, weight 15 g, wing chord 58.0 mm, wing arc 58.6 mm, tail 37.4 mm, tarsus 28.1 mm, bill from base 16.9 mm, iris red; 1 December 2005, BBFM 81 (MZB 30.748) adult, weight 13.5 g, wing -, wing chord 55.4 mm, wing arc 57.1 mm, tail 37.0 mm, tarsus 29.0 mm, bill from base 16.62 mm, iris dark red; additionally, three individuals were mist-netted, marked and released, all had a brown or dark brown iris and a weight of 14.5 g. All specimens were mist-netted during the same ten-day period in 2005 and at the same locality as the holotype.

Diagnosis.—Adult male most similar to *C. r. pratti* of far south-east PNG, but larger and has a prominent snowy-white throat, mentioned by Diamond (1985: 73) as a distinct feature of the Foja population. The back, mantle, breast-band and flanks are uniform dark olive-brown. The back tends towards Smithe's colour 21 (Fuscous) and the flanks toward colour 22 (Burnt Umber). The male of the new form possesses a narrow white belly patch along the midline; this differs from specimens of the nominate form we examined from Mount Missim (Kuper Range), which have a dull tan-washed belly patch. A single photographed female of the new form is paler and duller than the male, but does exhibit a distinct dark breast-band and pure white throat.

Etymology.—The proposed name honours Prof. Jared M. Diamond, an eminent expeditionary ornithologist of New Guinea, who was first to ascend into the Foja Mountains (and many other outlying ranges) and who has laid the modern foundation of the understanding of the ornithogeography of New Guinea.

Regional variation.—Remarkably, *C. robusta* exhibits two levels of regional variation (Diamond 1969: 18–19) that merit review and reassessment. There are at least eight distinct populations (including *C. r. diamondi*) inhabiting all of the mountain ranges of New Guinea. These comprise three well-defined plumage types distributed in a classic case of checkerboard allopatry (Fig. 2), in which the geographic distribution of the plumage types is wholly inter-digitated. This is not a case of plumage polymorphism, as there is no instance where more than one plumage type occurs in a single range.

The white-throated (dimorphic) type includes three named populations, A1 *C. r. pratti*, A2 *C. r. robusta* and A3 *C. r. diamondi*, plus A4, an unnamed form in the Kumawa Mountains of far western New Guinea (see Diamond 1985: 72–73). This form is distinct in two ways. First, the type is strongly sexually dimorphic, with a boldly plumaged male and a female with the plumage pattern substantially faded (see Coates 1990). Second, male plumage uniquely exhibits a bold dark-brown breast-band and a contrasting white throat.

The pale-washed (monomorphic) type includes two currently recognised forms, B1 from the Cyclops Mountains (*C. r. deficiens*) and B2 from the Arfak and Tamrau Mountains (*C. r. peninsularis*), and is found only in the aforementioned mountains of western New Guinea. This type is sexually monomorphic and resembles the female of the white-throated dimorphic type, but for the lack of an evident breast-band.

The buff-breasted (monomorphic) type includes two subspecies, C1 *C. r. bastille*, from the Torricelli and Bewani Mountains of the north coast of Papua and PNG, and C2 *C. r. sanfordi*, from the western half of the Central Cordillera as well as the mountains of the Wandammen Peninsula (Mount Wondiwoi) of the northern Bird's Neck region of Papua. This type is distinct from all others in its entirely uniform buff ventral plumage. As with the pale-washed type, this type is sexually monomorphic. Presumably, the buff-breasted and white-throated types meet in the Strickland Gorge country, which acts as an ornithogeographic discontinuity for montane birds (Beehler 2007).

This set of three nested distributions is puzzling (Fig. 2) and we are unable to provide a clear process of geographic differentiation that might generate such a pattern. In the absence of the somewhat intermediate pale-washed form, we have little doubt that the buff-breasted and white-throated forms should be treated as an unambiguous sister-species pair—two diagnosable species. But even with this pair of distinct forms, each with some level of infra-form variation, the geography is problematic, and in no way matches the pattern found in Diamond's 'drop-out' model of speciation (1972: 23). It will be interesting to learn what molecular analysis of this lineage will uncover (*cf.* B. Benz in prep.).

For now, we suggest future revisers consider elevating the *buff-breasted* populations (*C. r. sanfordi* and *C. r. bastille*) to species status, leaving the remaining forms in *robusta*, although treating each of the three 'types' as distinct merits consideration.

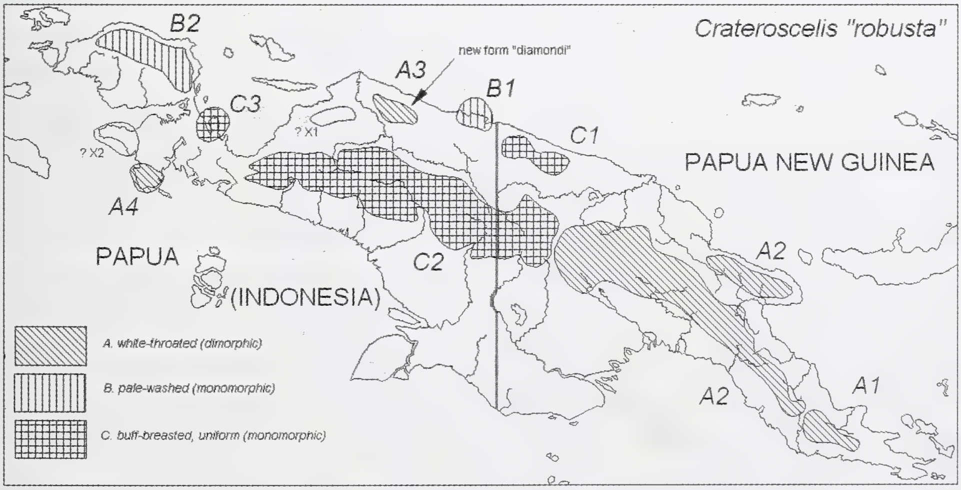

Figure 2. Populations of the *Crateroscelis robusta* complex. 'White-throated group' A1 = *C. r. pratti*, A2 = *C. r. robusta*, A3 = *C. r. diamondi*, A4 = undescribed Kumawa Mountains form characterised by Diamond (1985: 73); 'pale-washed group' B1 = *C. r. deficiens*, B2 = *C. r. peninsularis*; 'buff-breasted group' C1 = *C. r. bastille*, C2 = central range population of *C. r. sanfordi*, C3 = Wandammen/ Mount Wondiwoi population of *C. r. sanfordi*; undiagnosed forms x1 = expected Van Rees Mountains population, x2 = expected Fakfak population.

SMOKY ROBIN *Peneothello cryptoleucus cryptoleucus*

Specimen data.—24 November 2005, male, weight 24 g; 25 November 2005, unsexed, weight 18.5 g. Additional biometric data from birds released: weights: 16.4 g, 17.0 g, 18.0 g, 19.0 g, 19.5 g (*n*=2), 20.5 g, 22.5 g, 23.0 g.

Diamond (1985: 76) suggested the Foja population is referable to the white-bellied population *P. c. albidior* from the Weyland Mountains, but our study skin best matches the nominate form from the Bird's Head Peninsula, in its duskier belly and lack of a darker cap, evident in topotypical specimens of *P. c. albidior*.

GOLDENFACE *Pachycare flavogriseum*

During our studies at AMNH, M. LeCroy pointed out that the stunningly distinctive north coastal form of *Pachycare flavogriseum* from north-western PNG is undescribed. We describe this remarkable rainforest songbird as follows:

Pachycare flavogriseum lecroyae, subsp. nov.

Holotype.—Adult male, American Museum of Natural History (AMNH) no. 829706, collected by J. M. Diamond at 1,281 m on Mount Menawa, Bewani Mountains, northern PNG (03°12'S, 141°40'E), on 9 August 1966. Testes moderately enlarged; Diamond field no. 1330. Weight 16.2 g, wing chord 65.0 mm, tail 37.0 mm, tarsus 21.5 mm, bill from base 14.8 mm, feet grey, iris brown, bill black.

Paratypes.—Adult male, Mount Somoro, 945 m, 7 July 1966. Adult males AMNH 829698, 829701, 829703, Mount Nibo, 1,067 m, 10–17 July 1966. Adult male, AMNH 829704 Mount Menawa, 1,220 m, 4 August 1966. Adult females AMNH 829700, 829702, Mount Nibo, 854 m, 10 and 16 July 1966. All collected by J. M. Diamond. Weights (males) 16.5 g, 18.7 g, 19.5 g, 20.0 g, 20.5 g, (females) 15.4 g, 18.5 g, 19.5 g; wing chord (males) 62.0 mm, 63.0 mm, 64.0 mm, 64.5 mm, 65.0 mm, 65.3 mm, (females) 60 mm, 64 mm, 65 mm; tail (males) 34.0 mm, 37.0 mm, 37.5 mm, 38.0 mm, 40.0 mm, 40.5 mm, (females) 34.0 mm, 38.6 mm, 39.0 mm; tarsus (males) 21 mm (*n*=2), 22 mm (*n*=4), (females) 20.4 mm, 21.0 mm, 22.5 mm; bill from base (males) 16.9 mm, 17.0 mm (*n*=2), 17.5 mm, 18.0 mm, 18.5 mm, (females) 16.5 mm, 17.0 mm, 18.0 mm.

Diagnosis.—The new taxon's breast plumage is Spectrum Orange (Colour 17) in places grading to Orange Yellow (Colour 18; *fide* Smithe 1975), which is distinct from all other populations of the species, in which breast coloration ranges from orange-yellow to pale yellow. Breast coloration for the other named populations are as follows: *P. f. subpallidum*: Spectrum Yellow (Colour 55); *P. f. flavogriseum*: richer and deeper than Spectrum Yellow; *P. f. subaurantium*: slightly richer than the nominate form; and *P. f. randi*: Orange Yellow (Colour 18). The face, throat and breast of the various populations ranges from yellow to deep orange, with the new form being the most intense and spectacular of any of the subspecies. Apparently, Diamond did not describe this new form because he believed that its bright colour was fugitive and that with time his specimens would fade to match some of these other populations (Diamond 1972: 272–273). More than four decades have passed since Diamond collected his material from the north coastal ranges and the colour remains stunningly rich. The population from the Foja Mountains, which we heard but did not observe, remains uncollected.

Thus the population exhibiting the richest-orange plumage is found in the north coastal ranges of PNG, whereas the next-richest form is found on the northern slopes of the central ranges, in western New Guinea, and those slightly less rich in the Weyland Mountains of the far western central cordillera, followed by the mountains of the Bird's Head Peninsula. The least richly coloured form is found in eastern New Guinea. Examination of specimens of all described forms indicates no substantial mensural differences. Unlike the 'yellow' populations, which exhibit grades of ventral yellow, this population is unique and the specimens can be distinguished from some distance. By contrast *P. f. subpallidum* merits submersion into the nominate subspecies.

Distribution and habitat.—Apparently from mid-montane forest interior of the Bewani and Torricelli Mountains of PNG.

Etymology.—The proposed name honours Mary LeCroy of the Ornithology Department of the American Museum of Natural History, long a student of the avifauna of New Guinea, who over the years has provided unstinting expert advice and assistance in museum studies of the birds of the region.

MAYR'S STREAKED HONEYEATER *Ptiloprora mayri acrophila*

Specimen data.—Male weight 34 g, wing chord 99 mm, wing arc 100 mm, iris green; unsexed, weight 27.0 g, 30.5 g, wing chord 91.0 mm, 99.5 mm, wing arc 94.0 mm, 101.5 mm, iris green.

Additional material.—(Mist-netted and released) weight: 21.0 g, 23.0 g, 23.2 g, 24.0 g (n=2), 24.5 g, 26.0 g, 27.0 g (n=2), 28.0 g, 28.5 g, 30.5 g, 31.0 g, 31.5 g; wing chord 86.5 mm, 88.0 mm, 89.0 mm (n=2), 92.0 mm (n=2), 99.0 mm (n=2); wing arc 88.0 mm, 92.0 mm (n=3), 93.5 mm, 94.0 mm, 101.0 mm (n=2); iris green (all). Juvenile (yellow-washed plumage) weight 18.5 g, 22.5 g; wing chord 87 mm, 88 mm; wing arc 90 mm (n=2); iris grey (n=1), green (n=1).

Material from the Foja Mountains is attributable to *P. m. acrophila* from the PNG north coastal range, which is marginally differentiated from the nominate form from the Cyclops Mountains. As with *Rallicula* populations, the various populations of *Ptiloprora mayri* and *P. guisei* might best be treated as a single polytypic species (see Diamond 1968: 46–54).

ORNATE MELIDECTES *Melidectes ochromelas ochromelas*

Specimen data.—Female weight 64 g, 70 g, wing chord 125 mm, 126 mm, wing arc 126 mm, 129 mm, iris dark brown (n=2); juvenile? (unsexed) weight 61 g, wing chord 119 mm, wing arc 122 mm, iris dark brown. Foja material is closest to the nominate form from the Bird's Head Peninsula. This was one of the most vocal and common species in the Bog Camp environs.

WATTLED SMOKY HONEYEATER *Melipotes carolae*

The coordinates and elevation for the original type description of this species (Beehler *et al.* 2008) are corrected as follows: Bog Camp, Foja Mountains, Sarmi District, Papua, Indonesia, 1,652 m (02°34′22″S, 138°43′02″E).

GOLDEN-FRONTED BOWERBIRD *Amblyornis flavifrons*

Specimen data.—Adult males (n=2) testis 4 × 9 mm, 5 × 10 mm, weight 114 g, 117 g, wing chord 135.0 mm, 137.5 mm, wing arc 137 mm, 140 mm, iris dark brown (n=2); females (n=2), ova small (n=2), weight 105 g, 125 g, wing chord 130 mm, 132 mm, wing arc 132 mm, 136 mm, iris dark brown (n=2).

Additional material.—(Adult male plumage) weight 113 g, 115 g, wing chord 132 mm, 133 mm, wing arc 134 mm, 135 mm, iris dark brown (n=2); (female plumage) weight 114, 127 g, wing chord 131 mm, 132 mm, wing arc 133 mm, 137 mm, iris dark brown (n=2).

Female plumage.—We obtained the first examples of the adult female of this Foja endemic, described here. Not distinct from *A. macgregoriae* and *A. inornatus*. Crown Burnt Umber (22); mantle Cinnamon Brown (33) to Raw Umber (223); chin and upper throat with evidence of obsolete streaking, pale Cinnamon Drab (219c) to Ground Cinnamon (230); breast between Prout's Brown (121a) and Brussels Brown (121B); abdomen Buff (24) and Clay (26). Bill of dried specimen dark brown; legs black.

Habits.—Common and easily located in mid-montane elevations, the males attending display bowers on ridge crests in the forest interior. Each male attended his bower for much of each day, and gave remarkable mimetic sounds from a perch low down near the bower. Part of the never-before-observed high-intensity display, in which the male flares his crest into an orange crown and circles the bower was filmed in 2007 (see www.cbsnews.com/stories/2007/12/13/60minutes/main3615385_page3.shtml). This display is similar to that reported for Macgregor's Bowerbird (Frith & Frith 2004: 284).

BLACK SICKLEBILL *Epimachus fastuosus ultimus*
Specimen data.—Female, ova small, weight 177 g, wing chord 152 mm, wing arc 156 mm, tail 287 mm, tarsus 46 mm, bill from base 72 mm, iris orange with a brown inner ring. We found this species to be a vocal inhabitant of the forests above the Bog Camp. A single female was mist-netted and was indistinguishable from *E. f. ultimus* collected by Diamond in the Bewani Mountains of north-western PNG.

BRONZE PAROTIA *Parotia berlepschi*
The team observed, mist-netted, photographed and collected specimens of this 'lost' bird of paradise (*cf.* Gilliard 1969, Diamond 1985, Frith & Beehler 1996: 300). Its discovery in the Foja Mountains parallels Diamond's (1982) discovery of the 'lost' Golden-fronted Bowerbird. Known only from male-plumage trade skins collected in the 1890s, our field observations and specimens represent the first documentation of this population in life. We will address in detail the status and natural history of this species in a separate publication. We here suggest an English name for the species, based on its bronze-coloured crown.

CYCLOPS PAROTIA *Parotia* sp. indeterminate
While conducting surveys in the Yongsu Dosoyo region of the northern foothills of the Cyclops Mountains (Setio *et al.* 2002), BMB worked with a bird-hunter named Simson Nusa, who was very knowledgeable about the region's forest birdlife. BMB and SN spent considerable time discussing the regional avifauna, perusing the field guide plates and discussing particularly interesting species. During these discussions, SN noted that on a single occasion, while shooting birds from a canopy hide constructed in a fruiting tree, he shot an all-black, long-tailed *Parotia*, which he indicated was most similar to male Lawes' Parotia *P. lawesii*. Future field work in the Cyclops Mountains should make a special effort to determine whether a population of *Parotia* does inhabit the Cyclops Mountains, and whether this montane population is more closely related to the *Parotia* in the Fojas or that inhabiting the central range to the south.

Discussion

A third and final expedition to the Foja Mountains was completed in late December 2008. The results of that field trip will be presented in a subsequent paper, which will also summarise the entire known avifauna of the Foja Mountains. Based on the field trips reported here and the 2008 field work, we suggest that additional effort focusing on outlying ranges (*cf.* Diamond 1985)—especially the Kumawa, Fakfak, Van Rees, and Wandammen / Wondiwoi ranges—will prove productive. We also believe that additional work in the Cyclops Mountains is merited. In all cases, extensive mist-netting efforts will prove useful, as most early field efforts lacked this important survey tool. Finally, the addition of molecular analyses of the many outlying populations will assist in the clarification of relationships and taxonomic status of closely related forms.

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A new taxon of Collared Petrel *Pterodroma brevipes* from the Banks Islands, Vanuatu

by Vincent Bretagnolle & Hadoram Shirihai

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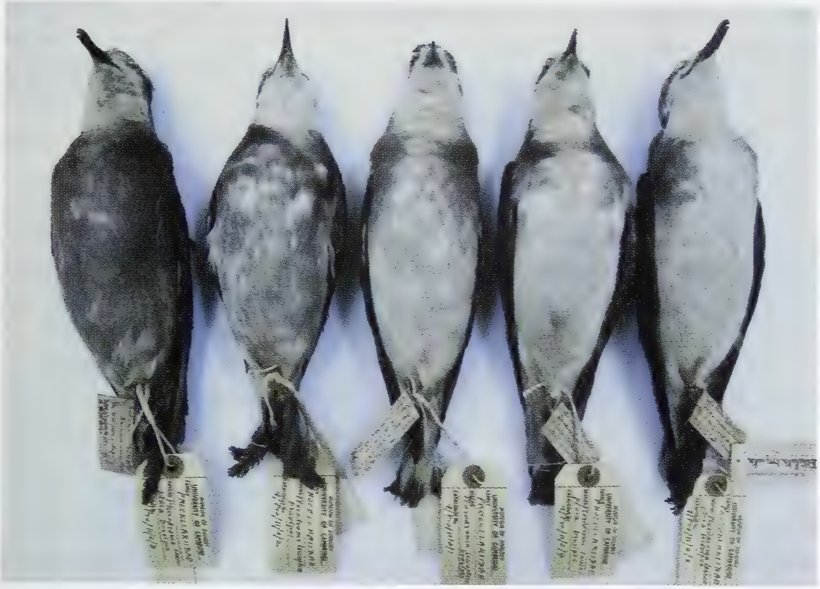
Summary.—A new taxon of all-dark and small-sized Collared Petrel *Pterodroma brevipes* is described from northern Vanuatu. The description is based on six specimens held at the American Museum of Natural History collected in 1927 east of Mera Lava, in the Banks Islands. We recently discovered the new taxon to be rather abundant around the Banks Islands, apparently located its breeding grounds, and described its unique feeding behaviour. The new taxon differs from other populations of *P. brevipes*, which mostly breed elsewhere in Vanuatu and in Fiji, in its combination of smaller size, with shorter wings but relatively longer tail, and shorter bill and tarsus. More importantly, unlike any other populations of *P. brevipes* which all are polymorphic, present evidence suggests that the new taxon occurs solely in a monomorphic dark form. The new taxon is at least as distinctive as many other recognised races and even species of petrels. Subspecies rank is allocated tentatively; with future study, the new taxon might merit species status.

Mostly due to predation by alien mammals at the breeding sites or direct harvesting by Man, many petrel taxa are globally threatened (www.birdlife.org/datazone). Some were even thought to be extinct but have been recently rediscovered, e.g., Zino's Petrel *Pterodroma madeira* (Zino & Zino 1986), Magenta Petrel *P. magentae* (Crockett 1979, 1994), Vanuatu Petrel *P.* (*cervicalis*) *occulta* (Totterman 2009, Shirihai & Bretagnolle 2010), Mascarene Petrel *Pseudobulweria aterrima* (Jouanin 1970, Bretagnolle *et al.* 1998), Beck's Petrel *P. becki* (Shirihai 2008) and New Zealand Storm Petrel *Oceanites* (*Pealeornis*) *maoriana* (Saville *et. al.* 2003). The increase in pelagic trips specifically designed to search for rare petrels never before seen at sea has also yielded the first documented at-sea records of Zino's Petrel *Pterodroma madeira* (Shirihai 2009) and Fiji Petrel *Pseudobulweria macgillivrayi* (Shirihai *et al.* 2009). In addition to rediscoveries, previously unrecognised petrel taxa may have been overlooked due to a combination of lack of knowledge and their remote ranges, one example being the still unresolved case involving the Black-capped Petrel *Pterodroma hasitata* complex of the Caribbean (Howell & Patterson 2008, Shirihai *et al.* 2010a).

We first became aware of the existence of a new form of Collared Petrel *Pterodroma brevipes* in northern Vanuatu in 1997, while studying specimens in the American Museum of Natural History, New York (AMNH), when VB found six dark-coloured specimens, collected at sea, by Rollo Beck during the Whitney South Sea Expedition in January 1927. These specimens were collected exactly at the same location (east of Mera Lava; Fig. 14) and at the same time as the *P. occulta* specimens that were suggested to represent a new species of petrel (Imber & Tennyson 1981). Then, during pelagic work in Melanesian waters post-2003, especially in January–March 2006 and 2007, HS photographed obviously different petrels on several occasions, including four extremely dark *brevipes* over the Torres Rise, *c.*150 km west of the Bank Islands (14°39′S, 165°16′E) on 16 February 2007. These observations led to new research into their identity: further visits were made to AMNH (in August 2008 and March 2010 by HS), and a special expedition was made to the Banks group in December 2009 (HS & VB) where we conducted observations on *P. brevipes*, and apparently discovered



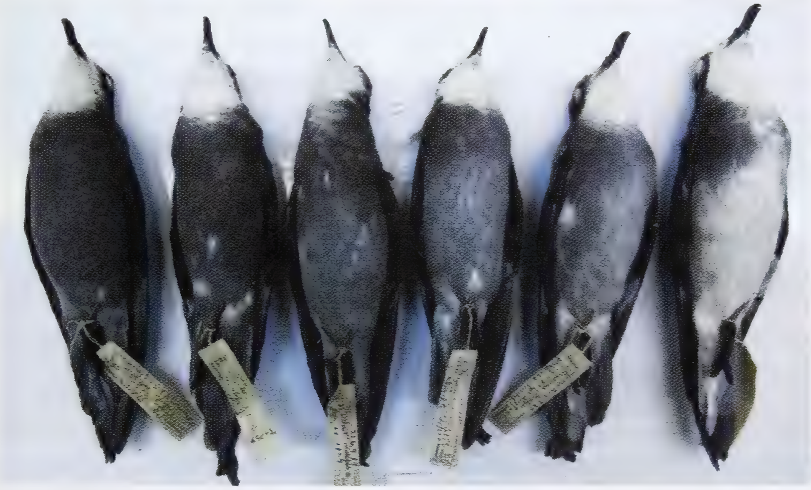


Figure 1 (top). Five specimens of Collared Petrel *Pterodroma brevipes* collected in Fiji, in the interior of Viti Levu (University Museum of Zoology, Cambridge, UK), showing the basic colour variation in the species. Plumage types are adopted from Watling (1986), which were used to score specimens and live birds at sea. From right to left: 'pure white'—the two right-hand specimens (this category includes completely clean white-bellied birds as well as those with a few very indistinct dark feather tips); 'grey peppering'—the middle specimen, with variable dark mottling and dappling, giving the underparts a blotchy appearance, but with a predominantly white belly; 'smoky'—fourth from right, with variable grey wash, but ground colour still pale and contrasts with breast-band, and many birds appear faintly blotched below (much individual variation between this, the previous and next categories); 'dark grey'—the left-hand specimen, with rather medium / dark and uniform grey pigments, and the dark breast-band is not obvious but still detectable in most. No 'extreme dark grey' type was found in collections other than in *P. b. magnificens* (Fig. 2). The percentage of each colour type is given in Table 2 (Hadoram Shirihai, © Tubenoses Project)

Figure 2 (bottom). Five left-hand specimens from the Banks Islands, northern Vanuatu (all held in AMNH) of *Pterodroma brevipes magnificens*, with left to right, AMNH 216921 and 222193 (both 'extreme dark grey'), 216919 (holotype) and 215400 (both 'dark grey'), and 216920 (borderline 'dark grey' but placed under 'smoky' because some *P. b. magnificens* can appear slightly paler grey below). The 'extreme dark grey' type seems unique to *P. b. magnificens*, it being found in two of the five specimens illustrated here (i.e. 40%), or in *c*.42% of birds scored during pelagic observations in the Banks (Table 2). The right-hand, pale-bellied bird (AMNH 216923) was collected at the same locality and on the same date as the others but is not *P. b. magnificens* (see text) (Hadoram Shirihai, © Tubenoses Project) the new form's breeding island. We compare our findings to *P. brevipes* observed at sea off Gau Island, Fiji (*cf*. Shirihai *et al*. 2009).

Murphy (1929), Bourne (1983) and Imber (1985) tackled the complexity posed by the subgenus (or superspecies) *Cookilaria*. All recent authors have chosen to treat *P. brevipes* and Gould's Petrel *P. leucoptera* as separate species (e.g., Watling 1986, Brooke 2004). Furthermore, Imber & Jenkins (1981) validated New Caledonian Petrel *P. l. caledonica* de Naurois, 1978, as a race of Gould's Petrel from New Caledonia, distinct from nominate *P. l. leucoptera* which breeds on Cabbage Tree Island, New South Wales, Australia. Since Murphy (1929) and Bourne (1983) no one has inferred that *P. brevipes* remains poorly known taxonomically, although Imber (1985) questioned whether more than one subspecies might be involved. Other than the pioneering work on *P. brevipes* by Watling (1986), no one has extensively examined the variation presented by this taxon. Despite that the holotype's provenance is doubtful (Murphy 1929), the type and co-type are indeed assignable to *P. brevipes* (pers. obs.). Our familiarity with all populations assigned to *P. brevipes* and *P. leucoptera* known to date, involving specimens in some of the world's major museums and live individuals in or around all of the breeding islands, has yielded the discovery of a new taxon of *P. brevipes*.

The morphometric differences found in six of the seven AMNH specimens (see below for AMNH 216923, which we consider separately) were augmented by study of plumage variation at sea, and by the apparently distinctive pelagic feeding behaviour. For our purposes here, we will focus mostly on standard morphological differences from all other populations of *P. brevipes*. Given that this work remains in progress (a thorough genetic analysis is currently ongoing), and the lack of any comparative acoustic studies, we conservatively assign the new taxon subspecies rank, under the following name:

Pterodroma brevipes magnificens subsp. nov.

Magnificent Petrel

Holotype.—See Fig. 2. American Museum of Natural History, New York (AMNH 216919). Male collected on 28 January 1927 by R. H. Beck at sea east of Mera Lava, Banks Islands, north Vanuatu. Precise locality unknown, but based on the original label, the AMNH catalogue, and the Whitney South Sea Expedition diary by Frederick P. Drowne, this is *c*.30 nautical miles east of Mera Lava (*cf*. Imber & Tennyson 2001). We are uncertain of the age of the holotype: all feather tracts are apparently of the same generation, suggesting a recently fledged bird, but many of the larger upperwing-coverts, tertials and scapulars are already worn and bleached browner, suggesting an adult. The bill is uniform black (without obvious horn-coloured markings characteristic of older individuals), which might also support the notion that it is juvenile, but in contrast the primary tips are round (not pointed) suggesting an adult. Finally, Beck labelled it as a male at 'nesting' stage, suggesting enlarged gonads, but Murphy who examined the specimens not long after they were skinned concluded that these were juveniles in slightly worn plumage (Murphy unpubl. MS at AMNH).

Measurements of the holotype.—Wing length 208.0 mm; tail length 97.0 mm; culmen (bill length from feathers) 23.0 mm; bill depth (at top of maxillary unguis to base of mandibular unguis) 8.0 mm; tarsus length 27.8 mm.

Paratypes.—See Fig. 2 and Table 1 (for mean values). AMNH 215400 (female), 216921 (male), 216920 (male) and 222193 (female), all collected by R. H. Beck at sea at the same locality as the holotype, on 28/29 January 1927. Measurements (by HS) as follows: AMNH 215400: wing 212.0 mm; tail 99.0 mm; culmen (to feathers) 21.5 mm; bill depth (top of

TABLE 1

Morphometrics of *Pterodroma brevipes magnificens*, other populations of Collared Petrel *P. brevipes* and Gould's Petrel *P. leucoptera*. Mean is given, followed by standard deviation and range. Details of measured specimens are presented in Appendix 1. A total of 120 specimens (all adults) were measured by VB. Specimens from the Banks Islands (n=6) were compared to other *P. brevipes*: we used both parametric (ANOVA) and non-parametric (Kruskal-Wallis) tests, because of reduced sample size. Significant tests appear in bold.

	N	Wing	Tail	Culmen	Bill depth	Bill width	Tarsus
P. brevipes magnificens (Banks Islands, Vanuatu)	6	210.3 ± 6.3 (206–222)	97.5 ± 4.6 (89–102)	22.9 ± 1.1 (21.5–24.6)	7.8 ± 0.5 (7.1–8.3)	9.8 ± 0.4 (9.5–10.4)	26.2 ± 1.2 (25.3–27.8)
AMNH 216923 (Banks Islands, Vanuatu)	1	224	107	24.0	7.4	9.95	27.5
P. brevipes (south Vanuatu)	16	216.9 ± 5.1 (208–224)	98.8 ± 4.3 (92–108)	24.3 ± 0.9 (22.6–25.7)	8.1 ± 0.5 (7.5–9.4)	10.5 ± 0.9 (9.4–12.4)	27.9 ± 1.6 (26.2–29.8)
P. brevipes (Fiji)	17	216.5 ± 5.0 (203–226)	96.9 ± 4.8 (86–103)	24.0 ± 1.0 (21.8–25.4)	7.8 ± 0.3 (7.4–8.5)	9.6 ± 0.7 (7.3–10.5)	27.4 ± 1.1 (25.2–29.4)
P. leucoptera caledonica (New Caledonia)	16	222.3 ± 6.5 211–234)	88.8 ± 6.1 (79–99)	25.6 ± 0.9 (23.1–26.8)	8.8 ± 0.4 (8.2–9.4)	10.4 ± 0.6 (9.4–11.9)	30.5 ± 1.3 (28.1–32.5)
P. l. leucoptera (Cabbage Tree Islands)	64	223.6 ± 4.7 (213–233)	96.3 ± 4.7 (85–112)	24.8 ± 0.8 (22.7–27.1)	9.2 ± 0.5 (8.4–10.8)	11.5 ± 0.6 (10.3–13.0)	30.2 ± 1.4 (27.7–34.2)
Comparison between *P. b. magnificens* and other *P. brevipes*							
ANOVA F (p)	39	**7.74 (0.008)**	0.03 (0.87)	**7.91 (0.008)**	1.17 (0.29)	0.44 (0.51)	**9.78 (0.003)**
Kruskal-Wallis X^2 (p)	39	**5.77 (0.02)**	0.003 (0.95)	**5.72 (0.02)**	0.72 (0.4)	0.64 (0.42)	**5.22 (0.02)**

maxillary unguis to base of mandibular unguis) 7.6 mm; tarsus 27.6 mm. AMNH 216921: wing 206.0 mm; tail 89.0 mm; culmen 23.0 mm; bill depth 7.1 mm; tarsus 25.25 mm. AMNH 216920: wing 212.0 mm; tail 101.0 mm; culmen 24.6 mm; bill depth 8.3 mm; tarsus 25.4 mm. AMNH 222193: wing 217.0 mm; tail 97.0 mm; culmen 22.0 mm; bill depth 8.1 mm; tarsus 25.8 mm. All sexual organs described as 'nesting' or 'enlarged'. Another specimen, AMNH 216922, could not be located during HS's visit in 2010: measurements were made by VB in 1997: wing 222.0 mm; tail 102.0 mm; culmen 23.4 mm; bill depth 7.4 mm; tarsus 25.3 mm.

Description of the holotype.—(see Fig. 2). Lower half of forehead to feathers around bill, front three-quarters of lores, and lower ear-coverts, chin and throat (almost to upper breast) pure white[1], forming solid white face that contrasts markedly with the rest of overall very dark plumage. Forehead mottled extensively with dark brown[2] feather tips, while white area of lower ear-coverts also unclean (slightly dappled with small dark[3] spots). Border between white throat and dark grey breast rather clear but some very fine paler grey[4] feather tips punctuate lower throat / upper breast border, forming mottling effect. From upper forehead there is a short whitish[5] supercilium (spotted and poorly defined)

Colour code footnotes: colour of type (AMNH 216919) measured directly against RAL Classic K1 colour book (02RALK1) and photos of the type also white-balanced and measured digitally by ColorSchemer Studio 2 (=CSS) scale software:

[1] RAL 9010/Pure white = CSS f9fafc (in parts unclean, forming RAL 9001/Cream & 9002/Grey white, or CSS e2e5d4 & cac8bb, respectively).

[2] RAL 8019/Grey brown = CSS 47444b.

[3] RAL 7022/Umbra grey & 7021/Black grey = CSS 5f677c & 3d3b3c.

[4] RAL 7030/Stone grey & 7012/Basalt grey = CSS 9d9789 & 605c6a.

[5] RAL 9010/Pure white = CSS f9fafc (in parts spotted with RAL 7022/Umbra grey & 7021/Black grey = CSS 5f677c & 3d3b3c).

starting just above dark lores in front of eye. Upper ear-coverts and area around eye and upper forehead onto crown / nape blackish with sooty-brown[6] hue, slightly darker / blacker than rest of upperparts. Much of upperparts very dark, the larger / outer scapulars, tertials, back and rump, smaller upperwing-coverts and uppertail being predominately dusky brown[7], whilst mantle and smaller / inner scapulars and larger upperwing-coverts paler due to presence of extensive blue-grey[8] bases (with brownish[9] tips); latter form scaly pattern. Uppertail-coverts paler (mid) blue-grey[10], approaching tone of underparts, and contrasting with dark grey-brown[11] rectrices. Only folded wing can be described, but dorsal contrast suggests the new taxon has only a relatively moderately developed upperwing M pattern[12]. Underwing pattern impossible to describe from folded wing, but most of larger coverts and flight feathers predominantly dark grey[13], without any visible paler grey or whitish bases and inner webs to remiges. Lesser primary-coverts carpal area and secondary-coverts form a black[14] area contrasting with whitish[15] inner coverts, axillaries and median secondary-coverts. Much of breast and belly dark ashy slate-grey[16], becoming slightly more uniform, darker[17] and more solid on breast. Narrow pale feather tips on belly, rear flanks and, especially, around legs to undertail-coverts produce slightly paler grey[18] and less uniform (more flecked) appearance, but do not disturb overall dark and uniform-looking underparts. Original label states iris colour as 'brown' and bill 'blue', but bill and feet are now black[19], and tarsal skin brownish[20].

The case of AMNH 216923.—R. Beck collected seven specimens at the same location (in two days). While the seven birds should be, at first glance, considered a single sample, one specimen shows striking differences. Indeed Beck collected a single pale-bellied bird, AMNH 216923 (see Fig. 2). In addition to being the only pale bird, this specimen is also larger (wing 223/224 mm, tail 107 mm, exposed culmen 24 mm and tarsus 27.5 mm). Finally, unlike the other six specimens, this specimen had 'small', i.e. undeveloped sexual organs. We thus tentatively conclude that it was a non-breeding wanderer from another *P. brevipes* population, probably southern Vanuatu, where *P. brevipes* are larger overall compared to birds from the Banks (see below). During December 2009 no similarly plumaged *P. brevipes* were observed (see below), further suggesting that any other pale *Cookilaria* must be rare in these waters, at least at this season.

Diagnosis.—*P. b. magnificens* differs from all populations of *P. brevipes / leucoptera* according to morphometrics and most importantly, plumage (see Table 1 for biometric data for *P. b. magnificens* and all other populations, and Table 2 for coloration). In mean values, the bill (exposed culmen) and tarsus length of *P. b. magnificens* is consistently smaller than

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[6] RAL 7012/Basalt grey & 8022/Black brown = CSS 3e332f & 040e1a.

[7] RAL 8011/Nut brown, 8022/Black brown & 5004 Black/blue = CSS 1b1d12, 332f2c & 262217.

[8] RAL 7016 Anthracite grey = CSS 293138.

[9] RAL 8019 Grey brown = CSS 201F17.

[10] RAL 5007 Brilliant blue = CSS 4E545D.

[11] RAL 7021 / Black grey (mostly outer webs) & 8022 Black brown (mostly inner webs) = CSS 110d02 & 21231e, respectively.

[12] RAL 8022/Black brown = CSS 060803.

[13] RAL 7026/Granite grey = CSS 71677f.

[14] RAL 9004/Signal black = CSS 0e0d09.

[15] RAL 9010/Pure white = CSS f9fafc.

[16] RAL 7012/Basalt grey = CSS 45453C.

[17] RAL 7021 Black grey = CSS 302c2d.

[18] RAL 7037 Dusty grey = CSS 635d5f.

[19] RAL 9011 Graphite black = CSS 040f0b.

[20] RAL 8028 Terra brown = CSS 3b2d22.

TABLE 2

Comparison of degree (by %, see Watling 1986) of ventral darkening between *P. b. magnificens* and other Collared Petrel *P. brevipes* populations: the scale is illustrated using specimens (Figs. 1) and birds photographed at sea (Figs. 4–11). Data are drawn from the following samples. **1**. *P. b. magnificens*: Banks Islands, northern Vanuatu (*n*=5), including the holotype, all held at AMNH (note 1: the 20% 'smoky' pattern involves the borderline case AMNH 216920, which could be described as 'dark grey' but some *P. b. magnificens* can appear a shade paler grey below). **2**. *P. b. magnificens*: live birds scored off the Banks Islands, northern Vanuatu, in December 2009 (Appendix 2) when 180 sightings of *P. b. magnificens* all involved birds that were dark ventrally, but only 57 could be properly evaluated for this analysis, as either 'dark grey' or 'extreme dark grey' (note 2: the 10.53% 'smoky' pattern involves six borderline birds, which could be categorised as 'dark grey' but are treated as 'smoky' because some *P. b. magnificens* can appear slightly paler grey below). **3**. *P. brevipes*: other populations from Fiji and Vanuatu, specimens from AMNH, the Natural History Museum, Tring, and the University Museum of Zoology, Cambridge, UK (*n*=26). **4**. *P. brevipes*: live birds captured and scored on Gau Island, Fiji (*n*=140) by Watling (1986) (note 3: Watling 1986 did not divide scored birds into 'dark grey' or 'extreme dark grey'). **5**. *P. brevipes*: live birds scored at sea off Gau Island, Fiji (*n*=98) during the Fiji Petrel *Pseudobulweria macgillivrayi* expedition (Shirihai *et al*. 2009; pers. obs) (note 4: the 2.04% 'extreme dark grey' involves two borderline cases with an underwing pattern almost as in the 'extreme dark grey' type but their underparts were still rather pale.

	Pure white	Grey peppering	Smoky	Dark grey	Extreme dark grey
1. ***P. b. magnificens***: type series, Banks Islands, northern Vanuatu (*n*=5)	0%	0%	20%[1]	40%	40%
2. ***P. b. magnificens***: birds at sea off Banks Islands, northern Vanuatu (*n*=57)	0%	0%	10.53%[2]	47.37%	42.11%
3. ***P. brevipes***: other populations from Fiji and Vanuatu. Museum specimens (*n*=26)	50.00%	23.08%	11.54%	15.38%	0%
4. ***P. brevipes***: live birds captured on Gau Island, Fiji (*n*=140)	37.00%	17.00%	29.00%	17.00% c	?[3]
5. ***P. brevipes***: live birds at sea off Gau Island, Fiji (*n*=98)	37.76%	21.43%	23.47%	15.31%	2.04%[4]

Fijian or other Vanuatu populations of *brevipes* by 4.6–5.8% and 4.4–6.1%, respectively. It is also consistently shorter winged (by 2.9–3.4%), but less so in tail (up to 1.3% shorter than some populations, but 0.4% longer than *P. brevipes* in Fiji and Vanuatu). Thus *P. b. magnificens* appears elongated posteriorly with a relatively longer tail but short rounded wings, which are especially appreciable in flight (Figs. 8–12). Its bill depth and width are similar to other populations of *P. brevipes* on Fiji and Vanuatu. As the only specimens available from Gau Island, Fiji, are preserved in liquid (Suva Museum, Fiji) we could not measure these birds, but measurements were presented in Watling (1986). *P. b. magnificens* also differs from birds on Gau in its 10.51% shorter culmen, 1.4% shorter wing and 6.21% shorter tail. Tarsus (mean 26.1 mm) as measured by Watling (1986) for birds from Gau is much shorter than any other population of *P. brevipes*. We assume that this reflects different measuring protocols and therefore do not compare our data with his for tarsus length.

Using the 120 specimens measured by VB in various museums (see Acknowledgements and Appendix 1) permitted further statistical analyses. Wing and culmen, and to a lesser extent, tarsus, differ significantly between the six birds from the Banks (treating AMNH 216923 apart) and all other *P. brevipes* (Table 1). Then we used a Principal Component Analysis (PCA), a multivariate analysis that permits using all of the biometric parameters simultaneously. The PCA revealed that the birds from the Banks are well separated from all

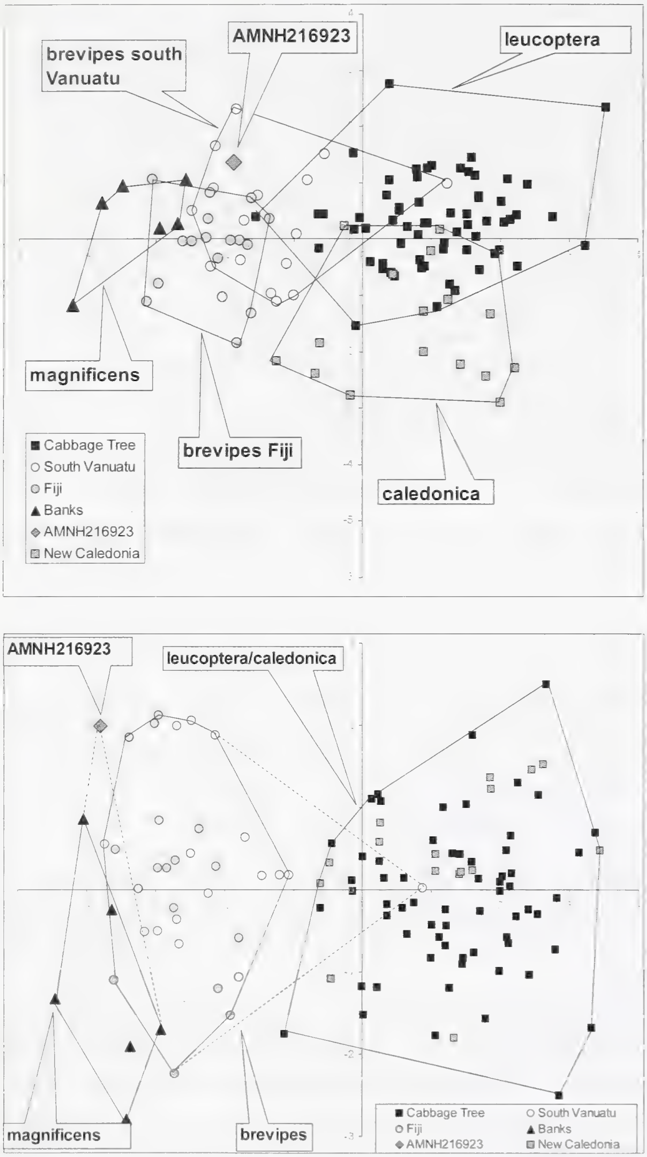


Figure 3. Results of multivariate analyses performed on 120 specimens belonging to the *P. leucoptera-brevipes* complex. Six biometric characters were used: wing, tail and tarsus lengths; and culmen, bill depth at hook and bill width at base. Solid lines represent the Minimum Convex Polygon (MCP) including all specimens from a given form. In both cases, first and second axes are presented. 3a) A Principal Component Analysis investigates whether the different forms split from each other. 3b) A canonical Discriminant Analysis is performed to separate *P. brevipes*, *P. leucoptera* and *P. b. magnificens*. MCP are also shown with (dots), or without (solid lines) outliers (see text).

P. brevipes (either from other islands of Vanuatu, or from Fiji; see Fig. 3a). The PCA also suggests that AMNH 216923 does not belong to *P. b. magnificens*. A bird from Tanna Island (AMNH 366704, a male collected on 2 April 1936) is a strong outlier. It was collected with three other birds on the same day and at the same colony; the others are typical *brevipes* from Vanuatu. AMNH 366704 differs mainly by its relatively longer tarsus and bill dimensions. Original measurements made by the collector (MacMillan) agree very well with our measurements (longer tail, larger bill). We also conducted a Discriminant Analysis, considering *P. leucoptera / caledonica* a single taxon, *P. brevipes* (Fiji and southern Vanuatu) as a single taxon, birds from the Banks a third taxon, and AMNH 216923 as a supplementary individual (i.e., the individual is not used in the discriminant function). The results (Fig. 3b) also indicate that birds from the Banks are at the extreme of the range shown by *P. brevipes*.

These statistics indicate in biometrics *P. b. magnificens* is at the extreme range of continuous variation within *brevipes*, and is at least distinctive as other close taxa. In particular, Imber & Jenkins (1981) supported separating *P. l. caledonica* from *P. l. leucoptera* given its only 2–3% larger mean bill, tarsus, tail and wing lengths. If biometrics might suggest clinal variation (with *P. b. magnificens* at the extreme), the most striking difference concerns coloration. Table 2 compares the morphs of *P. b. magnificens* and other populations of *P.*

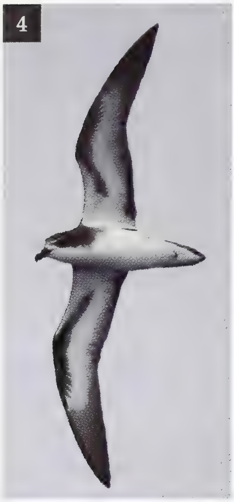
brevipes. We follow Watling's (1986) categorisation of colour variation in *P. brevipes* (see Fig. 1; compare also Figs. 2, 4–12). *P. b. magnificens* immediately recalls dark-morph *P. brevipes* on Viti Levu, Kadavu and Gau (Fiji), or from southern Vanuatu. However, in plumage *P. b. magnificens* differs from the latter in being monomorphic and solely occurring in a dark form. During December 2009 (see Appendix 2), all of the 180 *P. b. magnificens* observed were dark. Furthermore, of the latter, the 57 birds observed at close range or photographed at sea were categorised ventrally as 'dark grey' (Figs. 8–9) or 'extreme dark grey' (Figs. 10–12). The latter two accounted for *c*.90% of *P. b. magnificens* off the Banks, while the other 10% were only slightly paler grey ventrally (Fig. 8). In contrast, in all other populations of *P. brevipes* dark birds represent at most 17%. Being solely dark, *P. b. magnificens* completely lacks pale plumage types, 'pure white' and 'grey peppering', which form 54–73% of *brevipes* in other populations. Type 'smoky', which could be considered 'midway' in the spectrum of variation is also absent in *P. b. magnificens*, with only single incidences of borderline cases between 'smoky' and 'dark grey' (Table 2). Furthermore, the dark coloration of *P. b. magnificens* is on average even darker than that in other *P. brevipes* populations, with the darkest birds ('extreme dark grey') comprising *c*.40% of individuals scored in the Banks. Such birds have very dark underparts, and lack or have very faint breast-bands, and the very dark underwing shows only small white areas on the innerwing-coverts and the larger median covert row, with the remaining coverts and remiges dark grey or black.

The nature and degree of differentiation of *P. b. magnificens* versus other *P. brevipes* populations is at the same or a higher level than that seen in several other closely related petrels. Examples include the scarcely differentiated three taxa that comprise the *P. feae* complex (Shirihai *et al*. 2010, Gangloff *et al*. in prep.), the limited plumage differences between Vanuatu and White-necked Petrels (Imber & Tennyson 2001, Shirihai & Bretagnolle 2010), between the two races of Gould's Petrel, *P. l. caledonica* vs. *P. l. leucoptera* (Imber & Jenkins 1981) and between Cook's *P. cookii* and Pycroft's Petrels *P. pycrofti* (Shirihai 2007). Given that one of the key reasons for splitting Collared from Gould's Petrel is the former's dimorphic coloration, that *P. b. magnificens* is monomorphic acquires even greater significance.

Breeding locality and season.—In Appendix 2, we detail how *P. b. magnificens* was discovered to be presumably breeding on Vanua Lava Island. Although we did not observe any nests, we found clear evidence of breeding there. *1*. Petrels were seen coming close to land during the late afternoon / evening, when they seemed to 'mill' around at sea below the island, as if waiting for darkness to fly inland. *2*. In one case this involved a displaying pair close to the island. *3*. We obtained tape-recordings of display calls at the island's summit. These calls are typical calls of *P. leucoptera / brevipes*, and included flight (*titi*) as well as ground calls. Indeed, several birds were heard calling from the ground, both early at night and prior to morning departure.

The relatively large number of sightings, 180 in just eight days at sea, in the Banks suggests that *P. b. magnificens* is rather abundant locally. It could also breed on other islands in the Banks with similar habitat, especially Santa María Island (Gaua), where these petrels were also observed (see Appendix 2).

The breeding season in *P. b. magnificens* seems differentiated from other populations of *P. brevipes* for which data are available, although at this stage this is speculative. Based on the type series and our own observations (Appendix 2), *P. b. magnificens* breeds either in the austral summer or slightly earlier. Many that we saw in late December (if not most) were recent fledglings based on plumage condition (see, e.g., Figs. 9 and 11), although it seems odd that recent fledglings should remain close to their natal island. Birds collected in late January had enlarged gonads, which suggests either a rather extended breeding period or that the breeding season is actually summer. Totterman (2009), who visited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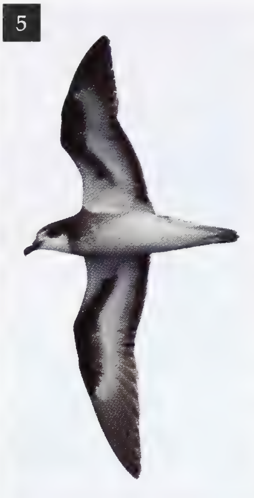
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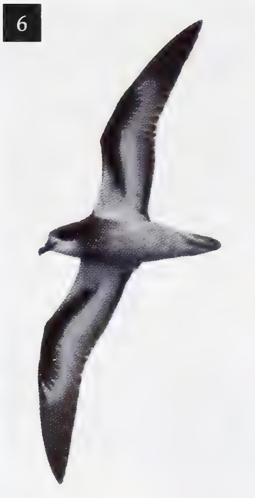
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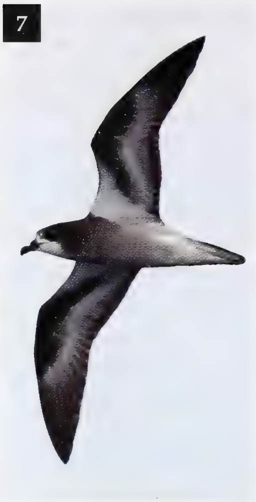
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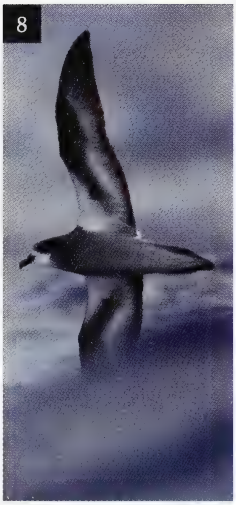
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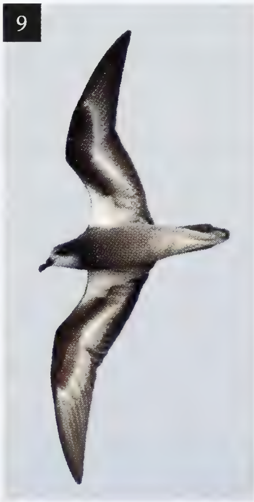
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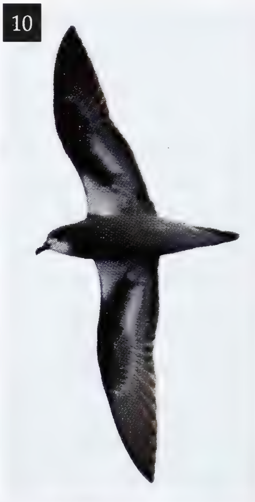
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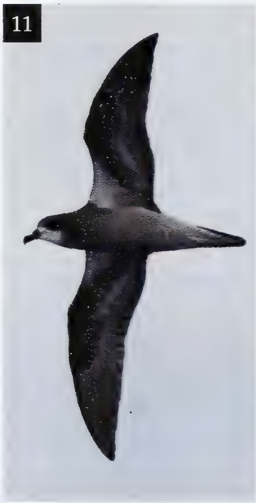
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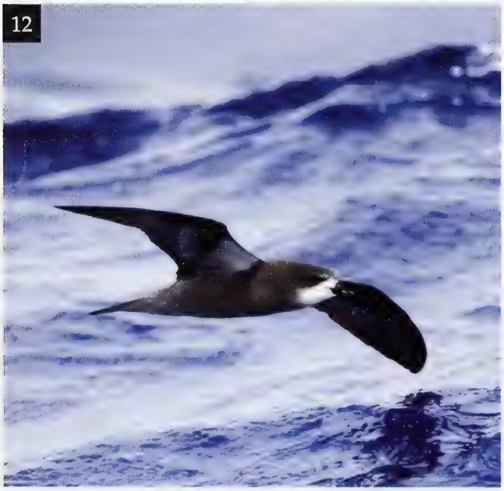
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the Vanuatu Petrel colony in March, apparently did not detect any *P. brevipes*, possibly indicating that they had not yet arrived at the colony. In contrast, most other populations of *P. brevipes* are autumn / winter breeders, sometimes from February / March or even later. For example, six chicks were collected in June on Kadavu, Fiji, and one in July on Tanna, southern Vanuatu (AMNH), while a fledgling was collected in September on Rarotonga, in the Cook Islands (National Museum, Wellington). The breeding season on Aneityum Island, southern Vanuatu, is apparently somewhat earlier: those collected by MacGillivray in February were apparently already well advanced in their breeding (MacGillivray 1860, Marchant & Higgins 1990, Brooke 2004). Watling (1986) mentioned that the only confirmed breeding in Fiji involves nests with chicks in May–June, with no evidence that the species breeds year-round.

The dispersal range and possible migration of *P. b. magnificens* remain to be elucidated, but we expect photographic evidence to become available concerning its occurrence away from the Banks.

Marine ecology and behaviour.—During December 2009, we carefully observed the foraging behaviour of *P. b. magnificens*. Unless feeding, during daylight at sea the taxon generally occurs singly. However, the feeding behaviour of these small *Pterodroma* off the Banks seems unique among *Cookilaria* (and perhaps all gadfly petrels), as they form sparse aggregations, almost invariably in association with mixed feeding frenzies of

Legends to plates on facing page

Figures 4–7. Plumage variation in Collared Petrel *Pterodroma brevipes* off Gau, Fiji (upper four images, from left to right): 'pure white'—the palest and cleanest white example, note the well-developed white supercilium but narrowest dark underwing bar; 'grey peppering'—blotchy underparts due to (highly variable) dark mottling and dappling, but belly predominantly white (birds of the last two categories dominate in nominate *P. brevipes* but are absent in *P. b. magnificens*); 'smoky'—dusky grey wash with ground colour still paler than next category and usually appears faintly blotched below, but dark breast-band distinctive (frequent in all *P. brevipes* but lacking in *P. b. magnificens* other than three borderline cases); and 'dark grey'—the usual darkest example found in Fiji (even darker birds are extremely rare) (Hadoram Shirihai, © Tubenoses Project)

Figures 8–11. Plumage variation in *P. b. magnificens* off the Banks, northern Vanuatu (lower four images, from left to right). 'Dark grey'—left-hand two birds (Fig. 8–9), such dark examples are virtually identical to nominate, with rather mid / dark and uniform grey underparts, and dark breast-band strongly reduced, but most *P. b. magnificens* tend to have less white in underwing. 'Extreme dark grey'—right-hand two birds (Fig. 10–11), represents the darkest category (and matches the holotype of *P. b. magnificens*), but in these waters even darker birds are observed. In particular, note the very dark underparts with virtually no darker breast-band and very dark underwing with only small pure white areas on the innerwing-coverts and larger median coverts, while the dark underwing bar almost encompasses half the wing's width (the broadest in any gadfly petrel)—this type is found in *c.*42% of *P. b. magnificens* off the Banks, but birds partially approaching it number *c.*2% off Gau, Fiji. Collectively, 'dark grey' and 'extreme dark grey' birds comprise *c.*90% of *P. b. magnificens* off the Banks, the other 10% are still quite dark, whereas in all other populations of *P. brevipes* the dark morph represents at most 17% of birds (see text and Table 2). Note that the bird in Fig. 8 was the palest *P. b. magnificens* observed off the Banks, considered borderline between 'smoky' and 'dark grey' plumage types. Such birds and the 'dark grey' type compromised *c.*58% of *P. b. magnificens*, which are identical in plumage to the darkest examples of dark-morph *P. brevipes* in other populations (Hadoram Shirihai, © Tubenoses Project).

At sea, it is very difficult to evaluate the precise extent of grey and white/grey areas in the underwing-coverts, or the width of the diagonal bar. And, in photos their appearance varies with the angle and light, and several images will be needed to reliably evaluate these features. We do not recommend attempting to identify *P. b. magnificens* away from its presumed breeding area.

Figure 12. Magnificent Petrel *Pterodroma brevipes magnificens*, in typical low flight—note that when sunlit the dark blue-grey underparts appear warmer and rustier brown. This bird belongs to the 'extreme dark grey' type (found in *c.*42% of *P. b. magnificens* off the Banks). Note the extremely limited pure white on the underwing, with small white innerwing-coverts, while the dark underwing bar is very broad (Hadoram Shirihai, © Tubenoses Project)

Figure 13. Vanua Lava (the presumed breeding island of Magnificent Petrel *Pterodroma brevipes magnificens*) from the north, showing its two volcanic cones (Hadoram Shirihai, © Tubenoses Project)

terns, noddies, boobies and shearwaters. Most such large mixed seabird concentrations we encountered included up to ten *P. b. magnificens*. For example, on 19 December 2009 the largest concentration of *P. b. magnificens* (ten) was among a flock of *c*.150 Wedge-tailed *Puffinus pacificus* and 40 Audubon's Shearwaters *P. lherminieri*, with 50 Sooty Terns *Onychoprion fuscatus*, many tens of noddies and small groups of Red-footed Boobies *Sula sula*. The same day we estimated that at least every flock of *c*.100 mixed seabirds contained on average three *P. b. magnificens*.

P. b. magnificens locate themselves at the rear of such flocks. The first birds to find fish shoals are the Sooty Terns and, as they start to dive, the *P. lherminieri* dive below the surface, before the *P. pacificus*, noddies and boobies join in, forming an energetic feeding frenzy; *Fregata* also attack the *Sula*. Then, as the flock disperses (or follows the terns) *P. b. magnificens* clean up any remaining fish scraps and / or squid on the surface. Local fisherman explained that a seasonally present small Bonito (or perhaps Skipjack Tuna *Katsuwonus* sp.) which is a very aggressive predator of other fish and squid, leaves many scraps floating on the surface that the petrels take. *P. b. magnificens* approach the flocks most characteristically, in very low flight (often between the waves and almost storm petrel-like) most like Bulwer's Petrels *Bulweria bulwerii* when patrolling for food (i.e. similar technique, height, mode and approach, and overall shape). Their dark coloration adds significantly to the *Bulweria* impression. Several times we also observed *P. b. magnificens* join the same feeding frenzy as Vanuatu Petrels: unlike *P. b. magnificens*, Vanuatu Petrel is specialised in aerial chasing and catching flying fish and squid, which escape the Pacific Tuna. Unlike Vanuatu Petrel, *P. b.*

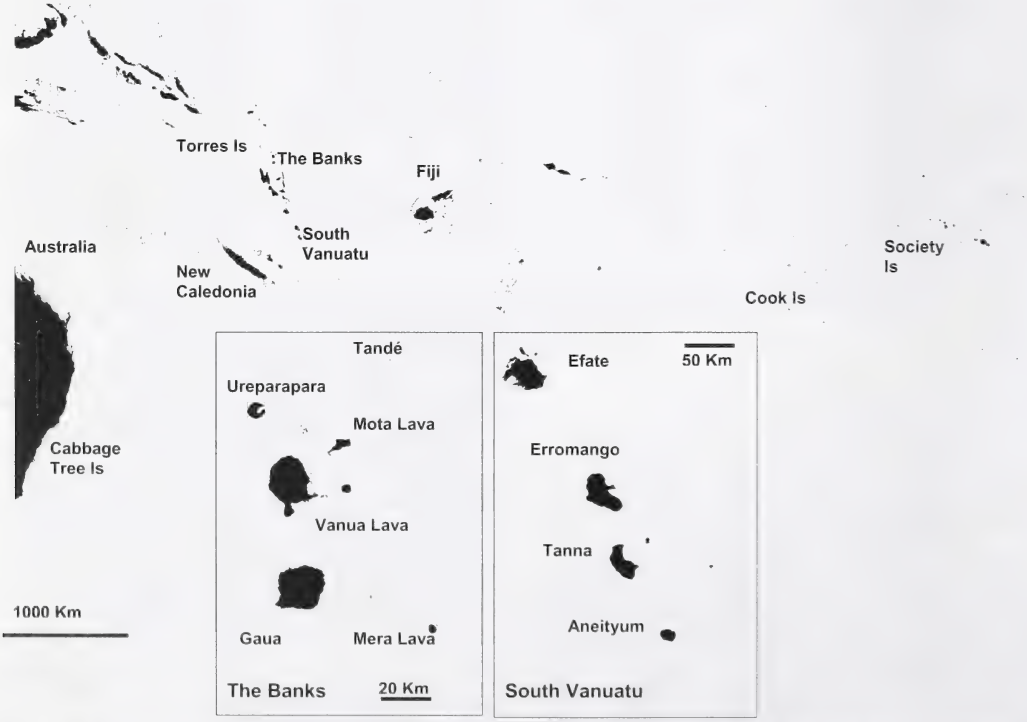

Figure 14. Map showing all localities cited in the text; at left, enlarged map of the Banks Islands, northern Vanuatu, where the pelagic survey in December 2009 was conducted (see Appendix 2). The type locality of *P. b. magnificens* is *c*.30 nautical miles east of Mera Lava, and the presumed breeding locality, the island of Vanua Lava is also shown.

magnificens is a scavenger that remains behind the flock, commencing to feed only as the flock starts to disperse or moves to the next location.

To our knowledge, these are the first observations of *Pterodroma* petrels forming constant feeding associations with inshore terns and boobies. Occasionally other gadfly petrels feed similarly, especially White-necked / Vanuatu and Juan Fernández Petrels *P. externa*, as well as several *Cookilaria* (De Filippi's *P. defilippiana*, Stejneger's *P. longirostris*, Gould's and Collared Petrels) and Black-winged Petrel *P. nigripennis* (pers. obs.), but such behaviour is never as habitually observed as in *P. b. magnificens* off the Banks. Interestingly, it is also the only gadfly petrel to our knowledge feeding so close to islands, which may be related to its very dark coloration (Bretagnolle 1993). However, it remains to be seen if such behaviour is seasonal, and to what degree it depends on factors such as oceanographic features.

Identification at sea.—*P. b. magnificens* mirrors several other subspecies and 'cryptic species' of petrels in lacking absolute diagnostic characters to separate it at sea from the dark morph of other *P. brevipes* populations. Especially away from the breeding islands, *P. b. magnificens* will not be separable with certainty: according to our observations *c*.60% of birds are identical to the darkest examples in other *P. brevipes* populations.

Nonetheless, *c*.40% of *P. b. magnificens* are even darker, and thus referred to the 'extreme dark grey' type, which has uniformly very dark underparts and much of the underwing, with a limited area of pure white on the innermost coverts and the larger row of median coverts, and a small white throat (see Figs. 9–10). In such birds the dark underwing bar almost covers half the width of the wing, i.e. the broadest of any gadfly petrel, even broader than Chatham Petrel *Pterodroma axillaris*. Unfortunately these differences are of limited use for field identification, because their correct appreciation at sea (and in photographs) is often hampered by the influence of light and angle of view, or it changes in relation to the way the wing is held. Much experience is also required to evaluate such differences correctly.

Furthermore, *P. b. magnificens* is, apparently, very distinctive in its feeding flight behaviour, but also to some extent at other times. It habitually flies very low, with short and low (steep) banks and arcs, long and very low glides, often with sudden sharp turns. Many times the birds adopt the flight mode and path of Bulwer's Petrel or prions (*Pachyptila*), a similarity heightened by their distinctive structure, with relatively short wings but a proportionately long pointed tail. Our impression is that it will prove possible to distinguish these birds on the basis of their distinctive flight behaviour and shape alone, given prolonged views and previous experience with *P. brevipes*. Furthermore, they are often notably slight-bodied and smaller with a shorter bill.

Away from their breeding islands, *P. b. magnificens* compared to dark-morph individuals of other *P. brevipes* populations cannot be reliably identified, but this should not prevent observers recording and photographing them. Only by such means might it eventually be possible to identify areas preferred by birds with extremely dark underparts and underwings, generally slighter / smaller size and the flight and feeding behaviours of *P. b. magnificens*.

We should emphasise that the plumage variation described here, based on our pelagic observations and photographs (from Fiji, Vanuatu and elsewhere in the tropical Pacific) of *P. b. magnificens* and other *P. brevipes* populations, is completely new, i.e. *contra* all previous handbooks and field guides (e.g. Harrison 1985, Carboneras *in* del Hoyo *et al*. 1992, Onley & Scofield 2007), which wrongly illustrate the underwing pattern and different morphs. This emphasises the need to combine field observations with a comprehensive review of museum material.

Taxonomic rank.—Available evidence suggests that *P. b. magnificens* should not be viewed within monotypic *brevipes*. It is diagnosable using the following combined features.

(i) Biometrically, *P. b. magnificens* is smaller (especially culmen, tarsus and wing) than other *P. brevipes* populations. (ii) Its plumage is unique within the *P. brevipes* complex in being monomorphic, and 40% darker than any dark morph of *P. brevipes*. (iii) It apparently breeds in the austral summer (but see above), unlike all other *P. brevipes* populations known to date.

Without comparative molecular analysis and playback experiments between *P. b. magnificens* and other *P. brevipes* populations, it is impossible to exclude either of Helbig *et al.*'s (2002) categories *4.1* (full species) or category *4.2* (allospecies). We conservatively rank *P. b. magnificens* as a subspecies of *P. brevipes* pending acoustic or molecular studies of the entire *P. brevipes / leucoptera* complex to be completed. Although the subspecies rank appears, to some extent, to be falling out of 'favour' in avian taxonomy, we favour such a conservative designation in this case.

We also emphasise that our recent molecular work on several petrel complexes (Gangloff *et al.* submitted, in prep.) have revealed considerable problems in using only cytochrome-*b* gene (cyt-*b*) markers, especially to establish species limits. Even using the Cytochrome Oxydase 1 gene (CO1) in addition to cyt-*b* divergence does not solve the problem of designating taxonomic ranks. In fact, we consider it highly advisable to combine molecular work with rigorous playback-response experiments, and analyses of morphology and behavioural ecology. Such integrative work is now in progress for the entire *leucoptera / brevipes* complex, which should help to resolve the taxonomic rank of *magnificens*. However, such work is likely to take several years and while in progress we consider it important recognise *magnificens*, at least subspecifically.

Conservation.—During our relatively short expedition in December 2009 we found *P. b. magnificens* to be not rare off the Banks. It is far more frequently encountered than Vanuatu Petrel, and is perhaps the second-most numerous petrel after *Puffinus pacificus*, being at least as common as Audubon's Shearwater *P. (lherminieri) gunax* (see Appendix 2). Nevertheless, Vanua Lava is the most populated island in the Banks and we suspect that feral pigs, cats *Felis catus* and introduced rats *Rattus* spp. could be significant threats to a small-sized petrel such as *P. b. magnificens*. On Mt. Suretamatai, we found no evidence of any alien mammals, but pigs occur only a few km from the volcano. No rats were trapped, though a single night trap was realised in December 2009.

Islanders suggested that local communities heavily exploited petrels and especially shearwaters on the Banks for many generations until the 19th century, but in recent years they have apparently only been infrequently harvested at most (Totterman 2009). Harvesting of Collared Petrels is especially well known from Fiji (Watling 1986) and apparently still occurs on Tanna (www.positiveearth.org/vanbirds/), but it remains to be seen if this practice still affects *P. b. magnificens* on the Banks.

Totterman (2009) found evidence at the summit of Mt. Suretamatai of predation on Vanuatu Petrels, perhaps by Peregrine Falcons *Falco peregrinus*, which species has been recorded hunting Gould's and Collared Petrels around or near colonies in Fiji and Australia, respectively (Watling 1986, Marchant & Higgins 1990). We found several Swamp Harriers *Circus approximans* on the slopes of the volcano, which species could also be a predator of petrels.

Vanua Lava volcano is still partially active, and a serious eruption would be devastating for its breeding petrels, as could be a major tropical cyclone in November–March, when both Vanuatu Petrel and *P. b. magnificens* are breeding.

According to BirdLife International, Collared Petrel is currently listed as Near Threatened because it is assumed to have a small and declining population, with very small and isolated subpopulations (www.birdlife.org/datazone). The conservation status of *P. b. magnificens* is unevaluated.

Etymology.—The subspecies epithet expresses our constant impression when watching these all-dark *Cookilaria* at sea. The new taxon represents one of the most attractive, if not *the* most attractive of gadfly petrels.

Acknowledgements

Particular thanks to Mary LeCroy at AMNH, as well as to Peter Capainolo, Paul Sweet and Thomas J. Trombone for their highly supportive attitude to our study and help with collecting DNA samples from specimens. We also thank staff at the Natural History Museum, Tring, particularly Mark Adams and Robert Prŷs-Jones, and Mike Brooke at the University Museum of Zoology, Cambridge (UK), for their assistance. Specimens were also measured at the Wellington, Sydney, Melbourne and Paris museums: we sincerely thank their curators (Sandy Bartle, Walter Boles, Wayne Longmore and Eric Pasquet) for access to specimens in their care. James Dean provided photographs and measurements of the type and co-type of *P. brevipes* in NMNH, Washington. We thank our fellow workers in December 2009: Audrey Sternalski, Orian Shirihai, Jakob Wikstrom, Eyal Jacobson and Maya Dvori-Jacobson, as well as the many people on Vanua Lava, Mota Lava and Uréparapara for their logistical help and welcome during our visit to the Banks Islands. François Levionnois (New Caledonia) helped HS charter boats especially in 2006–07. Dick Watling collaborated with HS during the Fiji Petrel expeditions and provided essential information on Collared Petrels in Fiji. Bill Bourne and Mike Imber kindly sent copies of several publications and suggested many improvements to the submitted draft (although not all of their suggestions were followed), Sandy Bartle helped with various issues relating to taxonomy and specimens, and Guy Dutson shared his records of Collared Petrel from the Solomons. Finally, Guy Kirwan and Kees Roselaar helped with some references and practical suggestions.

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APPENDIX 1: Specimens examined.—In both biometric and plumage analyses we used only specimens confirmed to be adults (or definitely full grown), with more or less similar feather wear and with also of birds collected on or in the vicinity of the breeding islands.

P. b. magnificens BANKS ISLANDS, NORTHERN VANUATU: AMNH 215400 (paratype), 216919 (paratype), 216920 (paratype), 216921 (holotype), 216922 (holotype) and 222193 (paratype).

P. b. brevipes THE BANKS, NORTHERN VANUATU: AMNH 216923.

P. b. brevipes TANNA ISLAND, SOUTHERN VANUATU: AMNH 336697–707.

P. b. brevipes ERROMANGO ISLAND, SOUTHERN VANUATU: AMNH 336476.

P. b. brevipes ANEITYUM (ANATOM) ISLAND, SOUTHERN VANUATU: BMNH 88.5.18.126–128.

P. b. brevipes ÉFATÉ ISLAND, SOUTHERN VANUATU: AMNH 211696.

P. b. brevipes VITI LEVU ISLAND, FIJI: AMNH 528336, 528337; BMNH 1879.6.2.3., 1888.5.18.125; Cambridge museum 9-pro-11-0-1, 9-pro-11-0-2, 9-pro-11-0-3, 9-pro-11-0-4, 9-pro-11-0-8.

P. b. brevipes KADAVU ISLAND, FIJI: AMNH 250890, 250892, 250893, 250899.

P. b. brevipes FIJI: Australian Museum, Sydney: A.2691-2, O.735.

P. b. brevipes GAU ISLAND, FIJI: Suva Museum (SMF) (specimens preserved in liquid) F581, F596, F591, F579, F582, F593, F590, F564, F586, F587.

P. l. leucoptera CABBAGE TREE ISLAND, AUSTRALIA: AMNH 528259–262, 528264–276, 528278, 528280–285, 528289–291, 528306, 528309–314, 529279; National Museum, Wellington 1265, 11378, 19268; Melbourne 4817, 4839–50, 4855; Australian Museum, Sydney: 03.02.41, O.65628, O.35175-6, O.16503-5, O.16507, O.16275, O.30238–40, O.63491, O.67676, O.5419, O.30237, O.16762, O.16991

P. l. caledonica NEW CALEDONIA: AMNH 824271; MNHN 1977.71, 1978.1019, 1978.1021–1978.1028, 1999.3100–1999.3102; National Museum, Wellington 2309.

APPENDIX 2: Pelagic survey in the Banks Islands, December 2009.—We visited the Banks Islands, Torba province, on 13–28 December 2009. These observations represent the first dedicated pelagic seabird survey since the Whitney South Sea Expedition in January 1927. The expedition covered the islands described below, and in the ocean around them we studied *P. b. magnificens* (see also map 1):

Santa María (14°16′S, 167°29′E) is the largest of the Banks Islands (342 km^2), with very rugged terrain reaching to Mt. Garat (797 m), the peak of the active composite volcano in the centre of the island. The volcano has a 54 km^2 caldera, within which is the crater lake, Lake Letas, the largest lake in Vanuatu. The most recent eruption was in 2010, but much of the caldera rim is still cool and forested. There are few beaches on the island, but many extensive reefs with sheltered waters inside. The island has a rather small human population, whose location changes based on volcanic activity. We checked the ocean south and north-west of the island on 18–19 December. On 18 December we operated a transect between the island of Santo (15°32′S, 167°14′E) and Santa María. All *P. brevipes*-type petrels observed, 41 in total, were *P. b. magnificens*:

the first was at 15°18.925'S, 167°19.221'E (at 11.14 h), and the last at 14°49.312'S, 167°26.907'E (18.06 h), with max. 12 at one location. Most *P. b. magnificens* were associating with inshore feeding frenzies of terns and noddies, boobies and shearwaters, which yielded the following totals: Wedge-tailed Shearwater *Puffinus pacificus* 300, Audubon's Shearwaters *P. (lherminieri) gunax* 20, Polynesian Storm Petrel *Nesofregetta fuliginosa* 2 at midnight just as we were about to anchor off West Gaua Island at 14°19.447'S; 167°25.322'E: the birds were attracted to the lights and hovered for *c.*2 minutes around the back of the boat (both were white-bellied), Great Frigatebird *Fregata minor* 3, Red-footed Booby *Sula sula* 50, Brown Booby *S. leucogaster* 20, Sooty Tern *Onychoprion fuscatus c.*75, Bridled Tern *O. anaethetus* 10, Black *Anous minutus* and Brown Noddies *A. stolidus* 100s with largest feeding concentrations off Santo (14°54.489'S, 167°22.555'E), and Pomarine Skua *Stercorarius pomarinus* 2 attacking the noddies. On 19 December at least 30 *P. b. magnificens* in sparse aggregations and feeding with other seabirds, mostly north-west of Gaua at *c.*14°04.15'S, 167°02.46'E: we encountered at least five major mixed seabirds concentrations within just three hours, all with 3–10 *P. b. magnificens*. Other seabirds included: Wedge-tailed Shearwater 250, Audubon's Shearwater 90, Great Frigatebird 20, Red-footed Booby 100, Brown Booby 30, Sooty Tern 70, Black and Brown Noddies *c.*200, and White Tern *Gygis alba* 3.

Vanua Lava (13°47'S, 167°28'E) is the second largest of the Banks (314 km²) and is very mountainous. Mt. Suretamate (= Mt. Suretamatai or Sere Ama, 921 m) is an active volcano (last major eruption 1965), but the island's highest point is 946 m. Its human population, of over 1,300, mostly lives in Sola (the capital of Torba province), in the east of the island, or Port Patteson. To the east are the islets of Kwakea and Ravenga. We used Sola as a base to access Uréparapara, Tandé and Mota Lava islands. On 24 December HS circumnavigated Vanua Lava in a small motor skiff, when *c.*15 *P. b. magnificens* were seen. Towards evening, from 17.00 h, six petrels came close inshore at the north-west corner of the island (13°44.263'S, 167°20.705'E) just 3–5 nautical miles out. These were probably breeders returning to colonies on the west side of Vanua Lava: at one stage two birds socialised, with one repeatedly following the other for a few seconds. Their behaviour suggested that they made landfall via a canyon at 13°44.300'S, 167°24.900'E. The voyage also yielded: Tahiti Petrel *Pseudobulweria rostrata* 1, Wedge-tailed Shearwater *c.*300, Audubon's Shearwaters *c.*50 (two adults were more worn, at end of active moult in wings, with still unmoulted and growing outer primaries), Great Frigatebird 20, Red-footed Booby 100s, Brown Booby 10s, Sooty Tern *c.*80, Black and Brown Noddies many 100s, but more of former, and Pomarine Skua 1 attacking noddies. On night of 26/27 December 2009 VB & A. Sternalski visited Mt. Suretamate to find the colony of Vanuatu Petrel (Totterman 2009, Shirihai & Bretagnolle 2010). The moon was nearly full, but clouds and rain meant that few petrels were calling, although VB sound-recorded several typical *P. brevipes / leucoptera*-type calls. Together with the observations at sea, this provides strong evidence of the petrel's breeding grounds.

Uréparapara (Parapara, 13°31'32"S, 167°19'36"E) is an extinct volcano whose cone reaches 764 m and has been breached by the sea on the east coast. It is the third-largest island in the Banks group (39 km²). The island is mostly covered by plantations and dense forest. The human population was estimated recently at *c.*500. We searched for petrels on both land (VB & A. Sternalski) and at sea (HS) on 20–23 December 2009. The original human population apparently numbered many thousands and any possible petrel population was probably extirpated long ago. However, some islanders showed VB & A. Sternalski an inactive breeding colony with *c.*5–7 empty burrows, whose diameter seemed concordant with a small petrel or, more likely, a large storm petrel such as *Nesofregetta*. The search at sea produced very few seabirds, including just one *P. b. magnificens*, 20 nautical miles offshore (13°15.119'S, 167°12.526'E) on 20 December.

Tandé (Vot Tandé or Vot Ganai, 13°15'34"S, 167°38'33"E) is 25 miles north-east of Uréparapara and was reached on 22 December 2009. Tandé has quite substantial vegetation and many breeding seabirds. It is uninhabited and relatively inaccessible because landing is not easy: the eastern, northern and southern sides are constantly exposed to big seas. En route to the island we observed seven *P. b. magnificens*. No petrel was seen at night around Tandé.

Mota Lava and Ra (13°40'15"S, 167°40'29"E) are relatively small (Ra is just a small islet), with white sand beaches and coral reefs on the west sides, but massive rocks in the centre and on the east side. Few people live on Mota Lava. HS visited the open ocean north and north-east of the island on 25–27 December 2009 (*cf.* Shirihai & Bretagnolle 2010), when 86 *P. b. magnificens* were observed: 17 on 25 December, 47 on 26 December and 22 on 27 December (with most in the evening when petrels are closer to Vanua Lava). Again these *P. b. magnificens* were observed with mixed seabird feeding flocks, e.g. Vanuatu Petrel 9 on 25 December, 18 on 26 December and 16 on 27 December; Wedge-tailed Shearwater max. 70, Audubon's Shearwater 20, Great Frigatebird 10, Red-footed Booby 70, Brown Booby 6, Sooty Tern 35, Black and Brown Noddies *c.*200.

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The taxonomic identity of *Motacilla luzonensis* Scopoli, 1786

by Jiří Mlíkovský

Received 23 February 2010

Pierre Sonnerat (1748–1814), French explorer and naturalist, described and figured from the island of Luzon, Philippines, a wagtail as *La Bergonette a collier de l'isle de Luçon* (Sonnerat 1776: 61, pl. 29; the specimen has not been preserved). Shortly thereafter, Giovanni Antonio Scopoli (1723–88), the Italian naturalist, gave this bird the Latin name *Motacilla luzonensis* (Scopoli 1786: 95). This name was widely applied to 'Indian' White Wagtails in the 19th century (see Sharpe 1885: 482 for a list of citations; note that it was often misspelled *luzoniensis*) until Swinhoe (1870: 121) observed that *M. luzonensis* should not be applied to Indian birds and suggested that the latter be named *alboides* Hodgson (1836: 191). This confusion was probably caused by the word *niger* in Scopoli's (1786) Latin diagnosis of *luzonensis*, which was understood to mean 'black' (Swinhoe 1870, Sharpe 1885: 482, Hartert 1905: 305, footnote) thereby pointing towards black-backed wagtails. However, 'niger' means 'black' or 'dark' in Neo-Latin, while neither 'canus' nor 'caesius' are suitable expressions for the grey colour on the back of grey-backed wagtails (e.g. http://lysy2.archives.nd.edu/cgi-bin/wordes.exe?gray). Thus, Scopoli was correct in using the word 'niger', although this did not enable him to differentiate between black-backed and grey-backed wagtails, which in turn led to the above-mentioned confusion.

Swinhoe (1870: 121), Sharpe (1885: 482) and Hartert (1905: 305, footnote) briefly discussed the identity of Sonnerat's *La Bergonette* or Scopoli's *Motacilla luzonensis*, but left it unresolved. With a modern revision of Palearctic wagtails at hand (Alström & Mild 2003), it is easy to identify Sonnerat's bird as an adult in winter plumage of the subspecies now generally called *M. alba ocularis* Swinhoe (1860: 55). Characteristic is the combination of grey upperparts, head pattern, broad white wing panel and white chin (see Alström & Mild 2003). The bird differs from the standard plumage of this subspecies only in lacking a black stripe on its lores, but this aberration is well known in *ocularis* (Alström & Mild 2003). *M. a. ocularis* is the only form of White Wagtail that regularly winters in the northern Philippines, including Luzon (Kennedy *et al.* 2000, Dickinson *et al.* 2001, Alström & Mild 2003). Sonnerat is well known for having assigned some birds to incorrect localities (Alexander 1924, Ly-Tio-Fane 1978; see also Cheke 2009), but this record fits our knowledge of the distribution of the forms of the White Wagtail and does not need to be doubted.

Motacilla luzonensis Scopoli, 1786, antedates *Motacilla ocularis* Swinhoe, 1860, and should thus be used for this wagtail form on the basis of the Principle of Priority. However, the currently prevailing use of *ocularis* for this subspecies should be continued, because both conditions of Art. 23.9.1. of the *International code of zoological nomenclature* (ICZN 1999; hereafter the Code) are met. First, I am unaware of any use of *M. luzonensis* Scopoli as a valid name after 1899 (Art. 23.9.1.1). Second, *M. ocularis* Swinhoe has been used as a valid name 'in at least 25 works, published by at least 10 authors in the immediately preceding 50 years and encompassing a span of not less than 10 years' (Art. 23.9.1.2). The required citations are: Deignan (1963: 195), Traylor (1967: 26), Thompson & DeLong (1969: 748), Byrd *et al.* (1978), Kišinskij & Lobkov (1979), Morlan (1981), Haffer (1985), Ölschlegel (1985), Howell (1990), Stepanyan (1990: 371), Brazil (1991: 203), Dickinson *et al.* (1991), Nuytemans (1998: 40), Artûhin *et al.* (2000), Kennedy *et al.* (2000: 308), MacKinnon & Phillipps (2000: 483), Carey

(2001: 335), Tomek (2002: 22), Winker *et al.* (2002), Alström & Mild (2003), Dickinson (2003: 740), Stepanyan (2003: 410), Tyler (2004: 777), Rasmussen & Anderton (2005: 315), Robson (2005: 278), Zheng (2005: 166), Koblik *et al.* (2006: 148) and Brazil (2009: 458). Thus, *Motacilla luzonensis* Scopoli, 1786, is a *nomen oblitum*, and *Motacilla ocularis* Swinhoe, 1860, is a *nomen protectum* in the sense of Art. 23.9.2. of the Code.

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The correct name of the West African subspecies of African Lemon Dove *Columba larvata*

by John Penhallurick

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Until the publication of Baptista *et al.* (1997) the subspecies of African Lemon Dove *Columba larvata* Temminck, 1810, which occurs from Sierra Leone east to Congo-Brazzaville, was known as *Columba* (previously *Aplopelia*) *larvata inornata*, based on *Haplopelia inornata* Reichenow, 1892, *Allgemeine Deutsche Ornithologische Gesellschaft zu Berlin*, Bericht, Febr. Sitzung: 6 (type locality: Buea, 950 m, Cameroon Range). Note that some authorities cite this name as Reichenow, 1892, *Journal für Ornithologie* 40: 221, but this issue was published in April 1892, whereas the citation from the *Allgemeine Deutsche Ornithologische Gesellschaft zu Berlin* was published on 19 February.

Baptista *et al.* (1997: 131) noted that with the transfer of African Lemon Dove from *Aplopelia* Bonaparte, 1855, to *Columba* Linnaeus, 1758, Reichenow's *inornata* became preoccupied through secondary homonymy (ICZN 1999, Art. 57.3) in *Columba* by *inornata* Vigors, 1827, the basis of Plain Pigeon, whose type locality is 'near Havana, Cuba'. Accordingly, they replaced Reichenow's name with *Columba larvata hypoleuca*, based on what they assumed to be the next available name: *Haplopelia hypoleuca* Salvadori, 1903, *Memorie della Reale Accademia delle Scienze di Torino*, ser. 2, 53: 96 (island of Annobón). This was accepted by Dickinson (2003: 160). I am grateful to R. J. Dowsett for pointing out that Annobón's location, the paucity of specimens from that island, and that because a different subspecies, *principalis* (Hartlaub, 1866) occurs on São Tome, just north of Annobón, it is not certain that *hypoleuca* is appropriate for West African birds.

However, with the transfer of all New World species previously placed in *Columba* to *Patagioenas* Reichenbach, 1853 (*cf.* Johnson & Clayton 2000), secondary homonymy between *inornata* Reichenow and *inornata* Vigors ceases (ICZN 1999, Art. 59.4; Morel *et al.* 1986). Thus the name of the West African subspecies of the African Lemon Dove should revert to *Columba larvata inornata* (Reichenow, 1892).

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The authorship of the name *Lophornis Verreauxii*; that of a subspecies of Festive Coquette

by Edward C. Dickinson

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There has been justifiable confusion regarding the authorship of the name of this hummingbird. Described on p. 193 of the 1853 *Revue et Magasin de Zoologie* (hereafter *Revue*), the name appeared as *Lophornis Verreauxii*, Bourc., par MM. Jules et Ed. Verreaux. Peters (1945: 32) ascribed the name to 'Bourcier and E. Verreaux'. Zimmer (1950: 17) ascribed the name to 'J. and E. Verreaux'. Zimmer wrote: 'The paper comprising the original description was undoubtedly written by Jules and Edouard Verreaux, although they cite Bourcier as authority for the name, probably from the label of the type. They appear as authors of the paper also in the list of contents at the end of the number of the Revue in which it appeared, but in the index to the entire volume Bourcier is given as the author of the paper and the name. In Mulsant and Verreaux's "Histoire naturelle des oiseaux-mouches" (vol. 3, p. 221) Boucier is cited as authority for the name, but on page 229, in a bibliography of papers by J. and E. Verreaux, the title of the original article again appears. Although there is no doubt that Bourcier planned to honor Edouard Verreaux by naming this bird for him, I see no way he can be credited even as part author since he had no connection with the original publication.' Zimmer's attribution was understandably retained by Züchner (1999: 568).

Zimmer was a remarkably accurate bibliographer; he may have missed the vital evidence which explains why the index to that volume of the *Revue* listed Bourcier as the author, or he may have judged that the rules of nomenclature then in use did not demand acceptance of Bourcier. The new name appeared in the May issue. In the June issue the final page, p. 288, included two errata and below them the following note: 'MM. J et Ed. Verreaux nous demandent de rectifier une erreur qui a été commise en imprimant leurs noms à la suite de celui de M. Bourcier. C'est à M. Bourcier seul qu'est due la description du *Lophornis Verrauxii*, page 193, pl. 6'.

Despite the real possibility that Zimmer's presumption of authorship was correct, and that the Verreauxs may have penned the description, there is little doubt that the connection between Bourcier's citation as author of the name in the original description, and the publisher's correction made at the behest of the Verreauxs in the very next issue of the *Revue*, makes it clear that Bourcier is the author under Art. 50.1.1 of the *International code of zoological nomenclature* (ICZN 1999).

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Index for Volume 130 (2010)

LIST OF AUTHORS AND CONTENTS

ABRAHAMCZYK, S. & KESSLER, M. Ecological and distributional notes on hummingbirds from Bolivian lowland forests ... 8

ALLEN, D. see ROUND, P. D.

ANDRETTI, C. B. see COSTA, T. V. V.

ANDRETTI, C. B. see JOHNSON, E. I.

ASCHER, J. S. see VALLELY, A. C.

AVENDAÑO, J. E. see DONEGAN, T. M.

BAHR, N. A new name for a subspecies of New World hawk ... 231

BALDERAMOS, P. see PHILLIPS, R.

BEEHLER, B. M. & PRAWIRADILAGA, D. M. New taxa and new records of birds from the north coastal ranges of New Guinea ... 277

BIAMONTE, E. see SANDOVAL, L.

BRETAGNOLLE, V. see SHIRIHAI, H.

BRETAGNOLLE, V. & SHIRIHAI, H. A new taxon of Collared Petrel *Pterodroma brevipes* from the Banks Islands, Vanuatu ... 286

BUDEN, D. W., WICHEP, J. & SANTOS, G. First record of Nicobar Pigeon *Caloenas nicobarica* in the Federated States of Micronesia ... 147

CASSEY, P. see MAURER, G.

CLAESSENS, O. see INGELS, J.

CLEERE, N. see PRŶS-JONES, R.

COLLINS, C. T. A review of natal pterylosis of passerines: useful information or avian marginalia? ... 96

COSTA, T. V. V. see JOHNSON, E. I.

COSTA, T. V. V., ANDRETTI, C. B., LARANJEIRAS, T. O. & ROSA, G. A. B. Discovery of White-winged Potoo *Nyctibius leucopterus* in Espírito Santo, Brazil, with remarks on its distribution and conservation in the Atlantic Forest ... 260

DARJONO see MALLO, F. N.

DICKINSON, E. C. see WELLS, D. R.

DICKINSON, E. C. The authorship of the name *Lophornis Verreauxii*; that of a subspecies of Festive Coquette ... 305

DONEGAN, T. M. & AVENDAÑO, J. E. A new subspecies of mountain tanager in the *Anisognathus lacrymosus* complex from the Yariguíes Mountains of Colombia ... 13

GALLARDO, R. J. see VALLELY, A. C.

GELIS, R. A. see GREENEY, H. F.

GUILHERME, E. see ZIMMER, K. J.

GREENEY, H. F., JUIÑA J., HARRIS, J. B. C., WICKENS, M. T., WINGER, B., GELIS, R. A., MILLER, E. T. & SOLANO-UGALDE, A. Observations on the breeding biology of birds in south-east Ecuador ... 61

GRIEVE, A. see KIRWAN, G. M.

HARRIS, J. B. C. see GREENEY, H. F.

HERLINA see MALLO, F. N.

INDRAWAN, M. see MALLO, F. N.

INDRAWAN, M. see RHEINDT, F. E.

INDRAWAN, M., MASALA, Y., DWIPUTRA, D., MALLO, F. N., MALESO, A., SALIM, A., MASALA, F., TINULELE, I., PESIK, L., KATIANDAGHO, D. S. & SUNOSOL Rediscovery of the Critically Endangered Banggai Crow *Corvus unicolor* on Peleng Island, Indonesia, part 1: ecology ... 154

INGELS, J. & VINOT, A. First nest of Dusky Purpletuft *Iodopleura fusca*, from French Guiana ... 71

INGELS, J., CLAESSENS, O., LUGLIA, T., INGREMEAU, P. & KENEFICK, M. White Wagtail *Motacilla alba*, a vagrant to Barbados, Trinidad and French Guiana ... 224

INGREMEAU, P. see INGELS, J.

JOHNSON, E. I., VARGAS, C. F., COSTA, T. V. V. & ANDRETTI, C. B. A range extension and ecology of Boat-billed Tody-Tyrant *Hemitriccus josephinae* in central Amazonian Brazil 266

JUIÑA J., see GREENEY, H. F.

KENEFICK, M. see INGELS, J.

KESSLER, M. see ABRAHAMCZYK, S.

KIRWAN, G. M. see PORTER, R. F.

KIRWAN, G. M. & GRIEVE, A. How many subspecies of Coal Tit *Periparus ater* are there in Iran? 83

KRABBE, N. & RIDGELY, R. S. A new subspecies of Amazilia Hummingbird *Amazilia amazilia* from southern Ecuador 3

LARANJEIRAS, T. O. see COSTA, T. V. V.

LOTH, D. see SANDOVAL, L.

LUGLIA, T. see INGELS, J.

MALLO, I. N. see MALLO, F. N.

MALLO, F. N., PUTRA, D. D., RASMUSSEN, P. C., HERLINA, SOMADIKARTA, S., INDRAWAN, M., DARJONO, MALLO, I. N., SWEET, P., RAHMAN, A., RAHARJANINGTRAH, W., MASALA, Y. & VERBELEN, P. Rediscovery of the Critically Endangered Banggai Crow *Corvus unicolor* on Peleng Island, Indonesia, part 2: taxonomy 166

MARTÍNEZ, D. see SANDOVAL, L.

MARTUSCELLI, P. see ZIMMER, K. J.

MASALA, Y. see MALLO, F. N.

MAURER, G., RUSSELL, D. G. D., WOOG, F. & CASSEY, P. The eggs of the extinct Egyptian population of White-tailed Eagle *Haliaeetus albicilla* 208

MEADOWS, B. S. On the status of Isabelline *Lanius isabellinus*, Turkestan *L. phoenicuroides* and Red-backed Shrikes *L. collurio* in the Eastern Province of Saudi Arabia 215

MLÍKOVSKÝ, J. Authorship and type specimens of *Uria mandtii* (Alcidae) 150

MLÍKOVSKÝ, J. The taxonomic identity of *Motacilla luzonensis* Scopoli, 1786 302

MILLER, E. T. see GREENEY, H. F.

NUPEN, L. see RYAN, P. G.

O'DONAHOE, J. see SANDOVAL, L.

PENHALLURICK, J. The correct name of the West African subspecies of African Lemon Dove *Columba larvata* 304

PHILLIPS, R., BALDERAMOS, P. & ROTH, D. First nesting of Northern Crested Caracara *Caracara cheriway* in Belize, Central America 69

PACHECO, J. F. see PIACENTINI, V. Q.

PIACENTINI, V. Q., PACHECO, J. F. & WHITNEY, B. M. The name *Ramphastos piperivorus* Linnaeus revisited 141

PORTER, R. F. & KIRWAN, G. M. Studies of Socotran birds VI. The taxonomic status of the Socotra Buzzard 116

PRAWIRADILAGA, D. M. see BEEHLER, B. M.

PRŶS-JONES, R. & CLEERE, N. The type specimen of Bonin Grosbeak *Chaunoproctus ferreorostris* 230

PUTRA, D. D. see MALLO, F. N.

PUTRA, D. D. see RHEINDT, F. E.

RAHARJANINGTRAH, W. see MALLO, F. N.

RAHMAN, A. see MALLO, F. N.

RAHMAN, A. see RHEINDT, F. E.

RASMUSSEN, P. C. see MALLO, F. N.

RHEINDT, F. E. New biogeographic records for the avifauna of Taliabu (Sula Islands, Indonesia), with preliminary documentation of two previously undiscovered taxa 33

RHEINDT, F. E., VERBELEN, F., PUTRA, D. D., RAHMAN, A. & INDRAWAN, M. New biogeographic records in the avifauna of Peleng Island (Sulawesi, Indonesia), with taxonomic notes on some endemic taxa 181

RIDGELY, R. S. see KRABBE, N.

ROSE, B. see RYAN, P. G.

ROUND, P. D. & ALLEN, D. A record of active moult in the Streaked Reed Warbler *Acrocephalus sorghophilus* 145

ROSA, G. A. B. see COSTA, T. V. V.,

ROTH, D. see PHILLIPS, R.

RUSSELL, D. G. D. see MAURER, G.

RYALL, C. Further records and updates of range extension in House Crow *Corvus splendens* 246

RYAN, P. G., NUPEN, L., ROSE, B. & SULEIMAN, A. S. Geographic variation in Socotra Sparrows *Passer insularis* 75

SÁNCHEZ, C. see SANDOVAL, L.

SÁNCHEZ, J. E. see SANDOVAL, L.

SANDOVAL, L., SÁNCHEZ, C., BIAMONTE, E., ZOOK, J. R., SÁNCHEZ, J. E., MARTÍNEZ, D., LOTH, D. & O'DONAHOE, J. Recent records of new and rare bird species in Costa Rica 237

SANTOS, G. see BUDEN, D. W.

SCHODDE, R. The identity and sources of *Palaeornis anthopeplus* Lear, 1831, and *P. melanura* Lear, 1832 (Regent Parrot), and their neotypification 219

SCHOENJAHN, J. The type and other early specimens of Grey Falcon *Falco hypoleucos* 102

SHIRIHAI, H. see BRETAGNOLLE, V.

SHIRIHAI, H. & BRETAGNOLLE, V. First observations at sea of Vanuatu Petrel *Pterodroma* (*cervicalis*) *occulta* 132

SOLANO-UGALDE, A. see GREENEY, H. F.

SOMADIKARTA, S. see MALLO, F. N.

SULEIMAN, A. S. see RYAN, P. G.

SUMMERS-SMITH, J. D. & TAGUCHI, F. House Sparrows *Passer domesticus* in Japan 273

SWEET, P. see MALLO, F. N.

TAGUCHI, F. see SUMMERS-SMITH, J. D.

TOMKOVICH, P. S. Assessment of the Anadyr Lowland subspecies of Bar-tailed Godwit *Limosa lapponica anadyrensis* 88

TURNER, D. A. The correct type locality of *Cisticola chiniana humilis* Madarász, 1904, with comments concerning the true identity of the collector 227

TURNER, D. A. *Merops oreobates* (Sharpe 1892): a monotypic species or not? 228

VALLELY, A. C., GALLARDO, R. J. & ASCHER, J. S. Notes on the birds of the Río Plátano Biosphere Reserve, including four new species for Honduras 52

VARGAS, C. F. see JOHNSON, E. I.

VERBELEN, P. see MALLO, F. N.

VERBELEN, F. see RHEINDT, F. E.

VINOT, A. see INGELS, J.

WELLS, D. R. & DICKINSON, E. C. Authorship of the broadbill genus name *Calyptomena* and the correct citations for this and *Calyptomena viridis* Raffles 143

WHITNEY, B. M. see PIACENTINI, V. Q.

WHITTAKER, A. see ZIMMER, K. J.

WICHEP, J. see BUDEN, D. W.

WICKENS, M. T. see GREENEY, H. F.

WINGER, B. see GREENEY, H. F.

WOOG, F. see MAURER, G.

ZIMMER, K. J., WHITTAKER, A., GUILHERME, E. & MARTUSCELLI, P. Documented records of White-cheeked Tody-Tyrant *Poecilotriccus albifacies* from Acre, Brazil 255

ZOOK, J. R. see SANDOVAL, L.

INDEX TO SCIENTIFIC NAMES

All generic and specific names (of birds only) are indexed. New specific and subspecific names are indexed in bold print under generic, specific and subspecific names. Illustrations and figures are numbered in italics.

Accipiter meyerianus 37, *42*
Accipiter rhodogaster 37, 38, 184
Accipiter trinotatus 37
Acrocephalus 146, 197
Acrocephalus agricola 146
Acrocephalus bistrigiceps 146
Acrocephalus dumetorum 146
Acrocephalus orientalis 146
Acrocephalus sorghophilus 145–147
Acrocephalus tangorum 146
Actitis hypoleucos 38, 184
Actitis macularius 224
aenea, Ducula 39, 162, 186
aeneus, Molothrus 243
Aerodramus ceramensis 190
Aerodramus infuscatus 190
Aerodramus sororum 190, 205
Aerodramus vanikorensis 41, 42, 190, 205
aeruginosus, Circus 210
aethereus, Nyctibius 263
affinis, Sarothrura 227
affinis, Thapsinillas 44, 194
agricola, Acrocephalus 146
alba, Gygis 301
alba, Motacilla 224–226, 302
albertinae, Streptocitta 38
albicilla, Haliaeetus 208–214, *211*
albicollis, Leucopternis 231
albicollis, Pseudastur 231
albifacies, Poecilotriccus 255–259, *256*
albifacies, Todirostrum 255
albilatera, Diglossa 63
albocoronata, Microchera 54, 55, *56*
albus, Corvus 249
Alisterus amboinensis 38, 188
alleni, Grallaria 98
amabilis, Cotinga 57
amabilis, Loriculus 39
Amadonastur lacernulatus 231
Amaurornis phoenicurus 184
amazilia, Amazilia 3–7, *5*
Amazilia amazilia 3–7, *5*
Amazilia amazilia azuay subsp. nov. 3
Amazilia chinogaster 9
Amazilia fimbriata 9
Amazona rhodocorytha 262
ambiguus, Ara 54
Amblycercus holosericeus 65
Amblyornis flavifrons 277, 283
Amblyornis inornatus 283
Amblyornis macgregoriae 283
amboinensis, Alisterus 38, 188
amboinensis, Macropygia 39, 184
americana, Rostrata 142
americanus, Numenius 239
amethysticollis, Heliangelus 65
ammodendri, Passer 77, *80*
Ammodramus aurifrons 66
Ampelion rufaxilla 66
anaethetus, Onychoprion 301
Anas crecca 237, 238
Anas discors 238
Anisognathus 23
Anisognathus igniventris 17
Anisognathus lacrymosus 13–32, *19*, 20, *21*
Anisognathus lacrymosus yariguierum subsp. nov. 16
Anisognathus melanogenys 13, 14, *20*, *21*, 24, 27, 30, 32
Anisognathus notabilis 13
Anisognathus somptuosus 13, 20
Anous minutus 301
Anous stolidus 301
anthopeplus, Palaeornis 219–223
Anthracothorax nigricollis 9
Anthreptes malacensis 38, 185
Aplonis mysolensis 38, 185
Aplopelia larvata 304
approximans, Circus 298
Ara ambiguus 54
Aratinga leucophthalma 65
Aratinga pertinax 240
Ardea purpurea 184
Ardea sumatrana 38
Arremon brunneinucha 67
Artamus leucorynchus 185
Artamus monachus 38, 185
aspasia, Nectarinia 204
Asturina 231
Asturina nitida 231
Atalotriccus 271
ater, Periparus *84*, 83–87
aterrima, Pseudobulweria 286
Atlapetes 22
Atlapetes latinuchus 67
Atlapetes pallidinucha 67
atrifrons, Zosterops 48, 198, *199*, 200, 205
atrogularis, Thryothorus 58
atropurpurea, Xipholena 262
augur, Buteo 129
aureoventris, Chlorostilbon 9, 10
aureus, Jacamerops 55
aurifrons, Ammodramus 66
autumnalis, Dendrocygna 238
axillaris, Pterodroma 297
azuay subsp. nov., Amazilia amazilia 3
azurea, Hypothymis 49, 201
Bangsia 13
bannermani, Buteo 118, 120, 121, 128, 129
barbata, Penelope 65
Basileuterus coronatus 64
Basileuterus luteoviridis 66
Basileuterus nigrocristatus 64
Basilornis galeatus 38, 203
baudinii, Calyptorhynchus 221
baueri, Platycercus 221

becki, Pseudobulweria 132, 286
bengalensis, Centropus 40, 184
berlepschi, Parotia 284
bernsteinii, Megapodius 37, 184
bistrigiceps, Acrocephalus 146
blumenbachii, Crax 262
boiei, Myzomela 49
boissonneautii, Pseudocolaptes 22
bonariensis, Molothrus 243
borealis, Phylloscopus 38, *197*, 198, 205
brachypterus, Buteo 117
bracteatus, Dicrurus 44, 193
bracteatus, Nyctibius 263
Bradypterus *42*, 46, 197, 207
Bradypterus castaneus *42*, 46, *207*
Bradypterus mandelli *42*, 46, *207*
Bradypterus seebohmi *42*, 46, *207*
brevipes, Pterodroma 286–301, *287*, *292*, *295*, *296*
brunneinucha, Arremon 67
brunnescens, Premnoplex 61
Bulweria bulwerii 296
bulwerii, Bulweria 296
Buteo 116, 117, 118, 120, 121, 122, 128, 231
Buteo albicollis delhoyoi nom. nov. 231
Buteo augur 129
Buteo bannermani 118, 120, 121, 128, 129
Buteo brachypterus 117
buteo, Buteo 116, 117, 118, 119, 120, 121, 123, *125*, 127, 128, 129
Buteo desertorum 117
Buteogallus 231
Buteogallus meridionalis 237, 238
Buteo jamaicensis 231
Buteo nitidus 231
Buteo oreophilus 116, 117, 118, 120, 121, 122, 123, *124*, 127, 128, 129
Buteo rufinus 116, 117, 118, 119, 120, 121, 122, *124*, 127, 128, 129
Buteo rufofuscus 129
Buteo socotrae 118
Buteo socotraensis 119, 120, 121, 122, 123, *124*, *125*, *126*, 127
Buteo buteo *125*
Buteo socotraensis sp. nov. 119
Buteo trizonatus 128, 129
Buthraupis 13
Butorides striata 184, 238
Cacatua leadbeateri 221
Cacomantis 40
Cacomantis sepulcralis 39, 40, *42*, 184
Cacomantis variolosus 39, 40, *42*
caerulescens, Diglossa 66
caesius, Thamnomanes 262
caledonica, Pterodroma 292
Calidris fuscicollis 224
Caloenas nicobarica 147–149, *148*
Calonectris diomedea 135, 244
Calyptomena viridis 143–145
Calyptorhynchus baudinii 221
Campylopterus largipennis 9
Campylorhynchus zonatus 243
capensis, Zonotrichia 66, 242
capitalis, Poecilotriccus 258
Caprimulgus celebensis 38
Caracara cheriway 69–70
carinatum, Electron 55
carmioli, Chlorothraupis *56*, 58
carolae, Melipotes 283
Carpodectes nitidus 57
carrikeri, Grallaria 98
castaneus, Bradypterus *42*, 46, 207
caudacutus, Hirundapus 38, 190, 205
caudata, Drymophila 65
cayanensis, Myiozetetes 241
celebensi, Pernis 184
celebensis, Caprimulgus 38
celebensis, Hirundapus 190
Celeus torquatus 262
Centropus bengalensis 40, 184
Cepphus grylle 150
ceramensis, Aerodramus 190
Certhia 198
certhiola, Locustella 146
cervicalis, Pterodroma 132, *133*, *134*, 135, *136*, *138*, 286
Ceyx lepidus 38
Chaetocerus mulsantii 9
Chaetura cinereiventris 52, 54
Chaetura vauxi 54
Chalcophaps indica 184
Chalcophaps indicus 38
Charmosyna pulchella 279
Chaunoproctus ferreorostris 230
chilensis, Vanellus 239
chinensis, Oriolus 45, 194
chinensis, Streptopelia 185, 205
chiniana, Cisticola 227–228
chinogaster, Amazilia 9
Chiroxiphia 98
chloris, Halcyon 38, 190
chloroptera, Myzomela 35, *42*, 49, 204, 205
Chlorornis 13
Chlorornis riefferii 66
Chlorospingus ophthalmicus 22, 66
Chlorospingus parvirostris 66
Chlorostilbon aureoventris 9, 10
Chlorothraupis carmioli *56*, 58
Chondestes grammacus 242
chrysocrotaphum, Todirostrum 271
chrysoparia, Dendroica 242
chrysura, Hylocharis 9, 10
cinerascens, Monarcha 49, 185
cinerea, Motacilla 38
cinereiventris, Chaetura 52, 54
cinereum, Todirostrum 66
cinereus, Haliaeetus 208
cinereus, Haliaëtos 209
cinnamomea, Pyrrhomias 63
Cinnycerthia unirufa 66
Cinnyris jugularis 38
Cinnyris pembae 249
Circus aeruginosus 210
Circus approximans 298
Cisticola chiniana 227–228
Cisticola exilis 185
Cisticola humilis 227

Cnipodectes subbrunneus 258
Cnipodectes superrufus 258
cochinchinensis, Hirundapus 190
Coeligena torquata 9, 10, 65
Colaptes rivolii 65
Collocalia esculenta 38, 41, 185, 190
collurio, Lanius 215–218
colonus, Rhinomyias 38, 200, 201
Columba 304
Columba larvata 304
Columba vitiensis 39
communis, Sylvia 218
Compsocoma 13, 17, 23
cookii, Pterodroma 293
Cookilaria 288, 297, 299
Coracina schistacea 44, 192
Coracina sula 38, 44
Coracina tenuirostris 156, *187*, 192
cornix, Corvus 247
coromanda, Halcyon 38, 191
coronatus, Basileuterus 64
coronatus, Platyrinchus 57
corone, Corvus 247
Corvus albus 249
Corvus cornix 247
Corvus corone 247
Corvus enca 38, 154, 157, 163, 166, 167, 168, 171, 172, 174, *176*, 177, 178, 179, 180, *187*, 194, *195*, 205, 250
Corvus ruficollis 123
Corvus splendens 246–254
Corvus typicus 154, 157, 163, 166, *176*, 177, 178
Corvus unicolor 154–165, *155*, 166–180, *173*, *175*, *176*, *177*, 194
Corythus enucleator 230
Cotinga amabilis 57
Cotinga maculata 262
Crateroscelis robusta 277, 279, *280*, *281*
Crateroscelis robusta diamondi subsp. nov. 280
Crax blumenbachii 262
crecca, Anas 237, 238
cristata, Lophostrix 54
Crotophaga major 240, 244
cruentata, Pyrrhura 262
Cryptoleucopteryx plumbeus 231
cryptoleucus, Peneothello 282
cucullatus, Orthotomus 34, 47, *197*, 205
Culicicapa helianthea 49, 201
culik, Pteroglossus 141
culik, Selenidera 141
cyanea, Diglossa 66
cyanoleuca, Notiochelidon 98
cyanoleuca, Pygochelidon 66
Cyanolyca turcosa 66
cyanus, Hylocharis 8, 9, 10
Cymbilaimus lineatus 56
Cymbilaimus sanctamariae 257
Cyphorhinus phaeocephalus 57
decumanus, Psarocolius 243
defilippiana, Pterodroma 297
delatrii, Tachyphonus *56*, 58
delattrei, Lophornis 9, 11
delhoyoi nom. nov., Buteo albicollis 231
Dendrocygna autumnalis 238
Dendroica chrysoparia 242
desertorum, Buteo 117
diadema, Ochthoeca 66
diamondi subsp. nov., Crateroscelis robusta 280
Dicaeum 197, 198
Dicaeum celebicum 38, 204
Dicrurus bracteatus 44, 193
Dicrurus hottentottus 44, 160, *187*, 193, 205
Dicrurus montanus 193
Diglossa albilatera 63
Diglossa caerulescens 66
Diglossa cyanea 66
diomedea, Calonectris 135, 244
discors, Anas 238
dives, Dives 237
Dives dives 237
dohertyi, Pitta 42
domesticus, Passer *77*, *80*, *273*, 273–276
Doryfera ludovicae 65
Drymophila caudata 65
dubium, Scissirostrum 185
Dubusia 13
Dubusia taeniata 66
Ducula aenea 39, 162, 186
Ducula forsteni 39, 186, 205
Ducula luctuosa 38
dumetorum, Acrocephalus 146
ecaudatus, Myiornis 271
Egretta garzetta 184
Egretta sacra 184
Elaenia gigas 66
Elainea 97, 98
Electron carinatum 55
Emberiza socotrana 128
enca, Corvus 38, 154, 157, 163, 166, 167, 168, 171, 172, 174, *176*, *177*, 178, 179, 180, *187*, 194, *195*, 205, 250
enucleator, Corythus 230
Epimachus fastuosus 284
Erithacus 98
Erithacus rubecula 86
erythrogaster, Pitta 42, 44, *191*, 192, 205
erythronota, Zoothera 34, 195, 196
erythrorhynchos, Pelecanus 238
Erythrura trichroa 50
esculenta, Collocalia 38, 41, 185, 190
Eudynamys melanorhynchus 38, 184
Eumyias panayensis 35, 48, 49
euophyrs, Thryothorus 66
Euphonia luteicapilla 59
eurizonoides, Rallina 184
Eurostopodus macrotis 38, 184
Eurystomus orientalis 38
exilis, Cisticola 185
externa, Pterodroma 297
Falco hypoleucos 102–115
Falco hypoleucus 104, 105, 107, 108, 109, 111
Falco moluccensis 38, 184
Falco peregrinus 123, 298
fasciatum, Tigrisoma 53, *56*
fasciatus, Myiophobus 66
fasciolata, Locustella *196*, 205

fastuosus, Epimachus 284
ferreorostris, Chaunoproctus 230
Ficedula hyperythra 35, 48, 196
Ficedula westermanni 38
fimbriata, Amazilia 9
flammulatus, Hemitriccus 258
flavifrons, Amblyornis 277, 283
flavogriseum, Pachycare 277, 282, *283*
flavoviridis, Trichoglossus 38
Florisuga mellivora 9
forbesi, Rallicula 279
forsteni, Ducula 39, 186, 205
Fregata minor 301
fuliginosa, Nesofregetta 301
funereus, Haliaeetus 208, *211*, 212
furcata, Thalurania 8, 9, 11
furcifer, Heliomaster 9
fusca, Iodopleura *71*, 71–72
fuscater, Turdus 66
fuscatus, Onychoprion 296, 301
fuscicollis, Calidris 224
galeatus, Basilornis 38, 203
galeatus, Lophotriccus 268
Gallirallus torquatus 184
Gampsonyx swainsonii 239
garzetta, Egretta 184
Gazzola typica 177
Gazzola unicolor 166, 167
Geranoaetus 231
Gerygone sulphurea 185
ghiesbreghti, Leucopternis 232
gigas, Elaenia 66
gilvus, Mimus 241
Glaucis hirsutus 9, 97
goisagi, Gorsachius 185
Gorsachius goisagi 185
Gorsachius melanolophus 185, *187*
Grallaria 98, 99
Grallaria alleni 98
Grallaria carrikeri 98
Grallaria guatimalensis 98
Grallaria hypoleuca 98
Grallaria nuchalis 65
Grallaria rufula 66, 98
Grallaria varia 98
Grallaria watkinsi 98
Grallaricula 98, 99
Grallaricula nana 19, 62
Grallaricula peruviana 98
grammacus, Chondestes 242
granadensis, Hemitriccus 66
grandis, Nyctibius 263
gravis, Puffinus 237, 238
griseicauda, Treron 38, 184
griseicollis, Scytalopus 19
griseipectus, Hemitriccus 271
griseisticta, Muscicapa 38, 185
griseonota, Pachycephala 49, *187*, 203, 205
griseus, Nyctibius 260, 263
grossus, Saltator 59
grylle, Cepphus 150
guatimalensis, Grallaria 98
guianensis, Morphnus 262
gularis, Paroaria 97
gunax, Pterodroma (lherminieri) 298, 301
Gygis alba 301
Halcyon chloris 38, 190
Halcyon coromanda 38, 191
Halcyon melanorhyncha 185
Halcyon sancta 38
Haliaeetus albicilla 208–214, *211*
Haliaeetus cinereus 208
Haliaeetus funereus 208, *211*, 212
Haliaeetus leucoryphus *211*, 212
Haliaeetus vocifer *211*, 212
Haliaëtos cinereus 209
Haliastur indus 38, 162, 184
Haplopelia hypoleuca 304
Haplospiza rustica 66
Harpia harpyja 262
harpyja, Harpia 262
hasitata, Pterodroma 286
Heliangelus amethysticollis 65
Heliangelus micraster 65
helianthea, Culicicapa 49, 201
Heliodoxa leadbeateri 9, 10
Heliomaster furcifer 9
hemileucus, Passer 75, *80*
Hemiprocne longipennis 42, 184
Hemispingus atropileus 66
Hemispingus melanotis 66
Hemitriccus 271
Hemitriccus flammulatus 258
Hemitriccus granadensis 66
Hemitriccus griseipectus 271
Hemitriccus josephinae 266–272, *267*, *269*, *270*, *271*
Hemitriccus zosterops 267, *268*
Henicorhina leucophrys 66
Hieraaetus kienerii 38, 185, 205
hirsutus, Glaucis 97
Hirundapus caudacutus 38, 190, 205
Hirundapus celebensis 190
Hirundapus cochinchinensis 190
Hirundo tahitica 38, 185
hispaniolensis, Passer 275
hispidus, Phaethornis 9
holosericeus, Amblycercus 65
holosericeus, Ptilonorhynchus 111
holostictus, Thripadectes 65
hottentottus, Dicrurus 44, 160, *187*, 193, 205
humilis, Cisticola 227
Hylocharis chrysura 9, 10
Hylocharis cyanus 8, 9, 10
Hyloctistes subulatus 52, 55
Hylopezus 98
hyperythra, Ficedula 35, 48, 196
hypoleuca, Grallaria 98
hypoleuca, Haplopelia 304
hypoleucos, Actitis 38, 184
hypoleucos, Falco 102–115
hypoleucus, Falco 104, 105, 107, 108, 109, 111
Hypothymis azurea 49, 201
icterotis, Platycercus 221
Ictinaetus malayensis 184
Idioptilon 271
igniventris, Anisognathus 17

indica, Chalcophaps 184
indicus, Chalcophaps 38
indus, Haliastur 38, 162, 184
inexspectata, Tyto 189
infuscatus, Aerodramus 190
insularis, Passer 75–82, *80*, *128*
Iodopleura fusca *71*, 71–72
Iridosornis rufivertex 22
isabellinus, Lanius 215–218
Jacamerops aureus 55
jamaicensis, Buteo 231
jamaicensis, Nyctibius 240
josephinae, Hemitriccus 266–272, *267*, *269*, *270*, *271*
jugularis, Cinnyris 38
jugularis, Nectarinia 185
kienerii, Hieraaetus 38, 185, 205
kuhli, Leucopternis 231
lacernulatus, Amadonastur 231
lacrymosus, Anisognathus 13–32, *19*, *20*, *21*
lafresnayii, Merops 228, 229
Lalage leucopygialis 38, 193
Laniocera rufescens 57
Lanio leucothorax 58
Lanius collurio 215–218
Lanius isabellinus 215–218
Lanius meridionalis 216
Lanius pallidirostris 216
Lanius phoenicuroides 215–218
lapponica, Limosa 88–95, *89*, *90*, *92*
largipennis, Campylopterus 9
Larus ridibundus 247
larvata, Aplopelia 304
larvata, Columba 304
latinuchus, Atlapetes 67
latrans, Scytalopus 62
leadbeateri, Cacatua 221
leadbeateri, Heliodoxa 9, 10
lecroyae subsp. nov., Pachycare flavogriseum 282
lepidus, Ceyx 38
Leptocoma sericea 38
Leptopogon rufipectus 66
leucocephala, Patagioenas 240, 244
leucogaster, Sula 301
leucophrys, Henicorhina 66
leucophthalma, Aratinga 65
leucoptera, Pterodroma 288, 289, *292*, 293, *298*, 300, 301
Leucopternis 231
Leucopternis albicollis 231
Leucopternis ghiesbreghti 232
Leucopternis kuhli 231
Leucopternis melanops 231
Leucopternis occidentalis 231
Leucopternis polionotus 231
Leucopternis princeps 231
Leucopternis schistaceus 231
Leucopternis semiplumbeus 231
leucopterus, Nyctibius 260–265, *261*, *263*
leucopygialis, Lalage 38, 193
leucorynchus, Artamus 185
leucoryphus, Haliaeetus *211*, 212
leucothorax, Lanio 58
leucurus, Threnetes 9
lherminieri, Puffinus 296
Limosa lapponica 88–95, *89*, *90*, *92*
lincolnii, Melospiza 242
lineatus, Cymbilaimus 56
lintoni, Myiophobus 66
Locustella certhiola 146
Locustella fasciolata *196*, 205
Locustella ochotensis 146
Lonchura malacca 243
Lonchura molucca 38, 185
longipennis, Hemiprocne 42, 184
longirostris, Pterodroma 297
longirostris, Rallus 239
longirostris, Thapsinillas 44, 194
Lophornis delattrei 9, 11
Lophornis Verreauxii 305–306
Lophostrix cristata 54
Lophotriccus 269, 271
Lophotriccus galeatus 268
Lophotriccus vitiosus 268, 271
Loriculus amabilis 39
Loriculus sclateri 39, 188
luctuosa, Ducula 38
ludovicae, Doryfera 65
lugubris, Poecile 86
lugubris, Surniculus 189, 205
Lurocalis semitorquatus 54, 262
Luscinia 98
luteicapilla, Euphonia 59
luteoviridis, Basileuterus 66
luteus, Passer *77*, *80*
luzonensis, Motacilla 302–304
macgillivrayi, Pseudobulweria 132, 286, 291
Macropygia amboinensis 39, 184
macrotis, Eurostopodus 38, 184
macularius, Actitis 224
maculata, Cotinga 262
maculosus, Turnix 184
madeira, Pterodroma 286
magentae, Pterodroma 286
magicus, Otus 41, 190
magnificens subsp. nov., Pterodroma brevipes 288
major, Crotophaga 240, 244
major, Parus 86
malacca, Lonchura 243
malacensis, Anthreptes 38, 185
malaris, Phaethornis 9
malayensis, Ictinaetus 184
Manacus 98
manadensis, Otus 190
manadensis, Turacoena 39, 184
mandelli, Bradypterus *42*, 46, 207
mandtii, Uria 150–152
maoriana, Oceanites 132
maoriana, Oceanites (Pealeornis) 286
maracana, Primolius 262
Margarornis squamiger 65
mayri, Ptiloprora 283
Mecocerculus poecilocercus 66
Mecocerculus stictopterus 66
Megalurus 197
Megapodius bernsteinii 37, 184

melanocephalus, Myioborus 63
melanogenys, Anisognathus 13, 14, *20*, *21*, 24, 27, 30, 32
melanoleucus, Spizaetus 54, 262
melanolophus, Gorsachius 185, *187*
melanopis, Schistochlamys 66
melanops, Leucopternis 231
melanorhyncha, Halcyon 185
melanorhynchus, Eudynamys 38, 184
melanospila, Ptilinopus 38
melanospilus, Ptilinopus 184
melanotis, Hemispingus 66
melanura, Palaeornis 219–223
melanurus, Passer 77, *80*
Melidectes 277
Melidectes ochromelas 283
Melipotes carolae 283
mellivora, Florisuga 9
Melospiza lincolnii 242
mendeni, Otus 189
mendeni, Zoothera 34, *187*, 195, *196*
meridionalis, Buteogallus 237, 238
meridionalis, Lanius 216
Merops lafresnayii 228, 229
Merops oreobates 228–229
Merops ornatus 38
Merops variegatus 228, 229
meyerianus, Accipiter 37, *42*
micraster, Heliangelus 65
Microchera albocoronata 54, 55, *56*
Microcochlearius 271
Mimus gilvus 241
minor, Fregata 301
minutus, Anous 301
Mionectes striaticollis 66
Molothrus aeneus 243
Molothrus bonariensis 243
molucca, Lonchura 38, 185
moluccensis, Falco 38, 184
monachus, Artamus 38, 185
Monarcha cinerascens 49, 185
Monasa morphoeus 55, 262
montanus, Dicrurus 193
montanus, Passer 77, *80*, 274
montanus, Zosterops 35, *42*, 47
Morphnarchus 231
Morphnus guianensis 262
morphoeus, Monasa 55, 262
Motacilla alba 224–226, 302
Motacilla cinerea 38
Motacilla luzonensis 302–304
Motacilla ocularis 302, 303
motitensis, Passer 78
mulsantii, Chaetocerus 9
murina, Phaeomyias 241
Muscicapa griseisticta 38, 185
Myioborus melanocephalus 63
Myioborus ornatus *21*, 22
Myiophobus fasciatus 66
Myiophobus lintoni 66
Myiornis 271
Myiornis ecaudatus 271
Myiozetetes cayanensis 241
Myrmornis torquata 52, 56
mysolensis, Aplonis 38, 185
Myzomela 197, 198
Myzomela boiei 49
Myzomela chloroptera 35, *42*, 49, 204, 205
Myzomela sanguinolenta 35, 49
Myzomela wakoloensis 49, 204
nana, Grallaricula 19, 62
nativitatis, Puffinus 244
Nectarinia aspasia 204
Nectarinia jugularis 185
nehrkorni, Zosterops 199
Neophron percnopterus 123
Nesofregetta fuliginosa 301
nicobarica, Caloenas 147–149, *148*
nigricans, Sayornis 66
nigricollis, Anthracothorax 9
nigripennis, Pterodroma 297
nigrobrunnea, Tyto 41, *42*
nigrocristatus, Basileuterus 64
nitida, Asturina 231
nitidus, Buteo 231
nitidus, Carpodectes 57
notabilis, Anisognathus 13
Notiochelidon cyanoleuca 98
nuchalis, Grallaria 65
Numenius americanus 239
Nyctibius 263
Nyctibius aethereus 263
Nyctibius bracteatus 263
Nyctibius grandis 263
Nyctibius griseus 260, 263
Nyctibius jamaicensis 240
Nyctibius leucopterus 260–265, *261*, *263*
Nyctiphrynus ocellatus 237, 241
obscura, Tiaris 97
occidentalis, Leucopternis 231
occidentalis, Pelecanus 238
occidentalis, Pseudastur 231
occulta, Pterodroma 286
occulta, Pterodroma (cervicalis) 132, *134*, *136*, *138*
Oceanites maoriana 132
Oceanites (Pealeornis) maoriana 286
ocellatus, Nyctiphrynus 237, 241
ochotensis, Locustella 146
ochromelas, Melidectes 283
Ochthoeca diadema 66
Ochthoeca rufipectoralis 66
ocularis, Motacilla 302, 303
olivacea, Piranga 96
olivaceus, Tiaris 242
Oncostoma 271
Onychoprion anaethetus 301
Onychoprion fuscatus 296, 301
ophthalmicus, Chlorospingus 22, 66
opisthomelas, Puffinus 244
oreobates, Merops 228–229
oreophilus, Buteo 116, 117, 118, 120, 121, 122, 123, *124*, 127, 128, 129
orientalis, Acrocephalus 146
Oriolus chinensis 45, 194
ornatus, Merops 38
ornatus, Myioborus *21*, 22

ornatus, Trichoglossus 184
Orthotomus cucullatus 34, 47, *197*, 205
Otus magicus 41, 190
Otus manadensis 190
Otus mendeni 189
Otus sulaensis 41, 190
Pachycare flavogriseum 277, 282, *283*
Pachycephala griseonota 49, *187*, 203, 205
Pachycephala pectoralis 38, 203
Pachyptila 297
Pachyramphus versicolor 66
pacificus, Puffinus 296, 298, 301
Palaeornis anthopeplus 219–223
Palaeornis melanura 219–223
pallidinucha, Atlapetes 67
pallidirostris, Lanius 216
palmarum, Thraupis 98
panayensis, Eumyias 35, 48, 49
Parabuteo 231
Paradisaea 277
parkeri, Scytalopus 63
Paroaria gularis 97
Parotia berlepschi 284
Parotia sp. 284
Parus major 86
parvirostris, Chlorospingus 66
parzudakii, Tangara 66
Passer ammodendri 77, *80*
Passer domesticus 77, *80*, *273*, 273–276
Passer hemileucus 75, *80*
Passer hispaniolensis 275
Passer insularis 75–82, *80*, 128
Passer luteus 77, *80*
Passer melanurus 77, *80*
Passer montanus 77, *80*, 274
Passer motitensis 78
Passer rutilans 77, *80*
passerina, Spizella 237, 242
Patagioenas 304
Patagioenas leucocephala 240, 244
pectoralis, Pachycephala 38, 203
Pelecanus erythrorhynchos 238
Pelecanus occidentalis 238
pembae, Cinnyris 249
pembaensis, Treron 249
Penelope barbata 65
Peneothello cryptoleucus 282
Percnohierax 231
percnopterus, Neophron 123
peregrinus, Falco 123, 298
Periparus ater *84*, 83–87
Periparus michailovskii 85
Periparus phaeonotus 85
Pernis celebensi 184
pertinax, Aratinga 240
peruviana, Grallaricula 98
phaeocephalus, Cyphorhinus 57
Phaeomyias murina 241
phaeonotus, Periparus 85
Phaethornis hispidus 9
Phaethornis malaris 9
Phaethornis ruber 9
Phaethornis stuarti 9, 11
Phaethornis subochraceus 9, 11
Phaetusa simplex 240, 244
Phelpsia 97
phoenicuroides, Lanius 215–218
phoenicurus, Amaurornis 184
Phylloscopus borealis 38, *197*, 198, 205
Phylloscopus poliocephalus 35, *42*, 47, 198, 205
Phylloscopus sarasinorum 198
Phylloscopus taxon novum *187*, 198, 205
pileatus, Platycercus 221
piperivora, Selenidera 143
piperivorus, Ramphastos 141–143
Pipra 98
Pipreola riefferii 66
Piranga olivacea 96
Pitta dohertyi 42
Pitta erythrogaster 42, 44, *191*, 192, 205
platurus, Prioniturus 38, *187*, 188, 205
Platycercus baueri 221
Platycercus icterotis 221
Platycercus pileatus 221
Platycercus stanleyii 221
Platyrinchus coronatus 57
plumbeus, Cryptoleucopteryx 231
Poecile lugubris 86
poecilocercus, Mecocerculus 66
Poecilothraupis 23
Poecilotriccus 271
Poecilotriccus albifacies 255–259, *256*
Poecilotriccus capitalis 258
Poecilotriccus ruficeps 66
poliocephalus, Phylloscopus 35, *42*, 47, 198, 205
poliocephalus, Turdus *42*, 45
polionotus, Leucopternis 231
polionotus, Pseudastur 231
Premnoplex brunnescens 61
Primolius maracana 262
princeps, Leucopternis 231
Prioniturus platurus 38, *187*, 188, 205
Procnias tricarunculatus 57
Psarocolius decumanus 243
Pseudastur 231
Pseudastur albicollis 231
Pseudastur occidentalis 231
Pseudastur polionotus 231
Pseudobulweria aterrima 286
Pseudobulweria becki 132, 286
Pseudobulweria macgillivrayi 132, 286, 291
Pseudobulweria rostrata 132, 301
Pseudocolaptes boissonneautii 22
Pseudotriccus ruficeps 66
Pterodroma 297
Pterodroma axillaris 297
Pterodroma brevipes 286–301, *287*, *292*, *295*, *296*
Pterodroma brevipes magnificens subsp. nov. 288
Pterodroma caledonica 292
Pterodroma cervicalis 132, *133*, *134*, 135, *136*, *138*, 286
Pterodroma (cervicalis) occulta 132, *134*, *136*, *138*
Pterodroma cookii 293
Pterodroma defilippiana 297
Pterodroma externa 297
Pterodroma hasitata 286

Pterodroma leucoptera 288, 289, *292*, 293, 298, 300, 301
Pterodroma longirostris 297
Pterodroma madeira 286
Pterodroma magentae 286
Pterodroma nigripennis 297
Pterodroma occulta 286
Pterodroma pycrofti 293
Pteroglossus culik 141, 142
Ptilinopus melanospila 38
Ptilinopus melanospilus 184
Ptilinopus subgularis 38, 188
Ptilinopus superbus 186, 205
Ptilonorhynchus holosericeus 111
Ptilonorhynchus violaceus 111
Ptiloprora mayri 283
Puffinus gravis 237, 238
Puffinus lherminieri 296
Puffinus (lherminieri) gunax 298, 301
Puffinus nativitatis 244
Puffinus opisthomelas 244
Puffinus pacificus 296, 298, 301
puffinus, Puffinus 244
Puffinus puffinus 244
pulchella, Charmosyna 279
purpurea, Ardea 184
Purpureicephalus spurius 221
pycrofti, Pterodroma 293
Pygochelidon cyanoleuca 66
Pyrrhomias cinnamomea 63
Pyrrhura cruentata 262
Rallicula forbesi 279
Rallicula mayri 279
Rallina eurizonoides 184
Rallus longirostris 239
Ramphastos piperivorus 141–143
Ramphastos tucanus 142
Rhinomyias colonus 38, 200, 201
Rhipidura teysmanni 49, 201, *202*, 203, 205
rhodocorytha, Amazona 262
rhodogaster, Accipiter 37, 38, 184
ridibundus, Larus 247
riefferii, Chlorornis 66
riefferii, Pipreola 66
rivolii, Colaptes 65
robusta, Crateroscelis 277, 279, *280*, *281*
rosenbergii, Tyto 189
Rostrata americana 142
rostrata, Pseudobulweria 132, 301
Rostrata viridans 142
rubecula, Erithacus 86
ruber, Phaethornis 9
rufaxilla, Ampelion 66
rufescens, Laniocera 57
ruficapilla, Vermivora 242
ruficeps, Poecilotriccus 66
ruficeps, Pseudotriccus 66
ruficollis, Corvus 123
rufinus, Buteo 116, 117, 118, 119, 120, 121, 122, *124*, 127, 128, 129
rufipectoralis, Ochthoeca 66
rufipectus, Leptopogon 66
rufipectus, Spilornis 38, 184
rufivertex, Iridosornis 22
rufofuscus, Buteo 129
rufula, Grallaria 66, 98
rufus, Selasphorus 11
Rupornis 231
rustica, Haplospiza 66
rutilans, Passer 77, *80*
sacra, Egretta 184
Saltator grossus 59
sancta, Halcyon 38
sanctamariae, Cymbilaimus 257
sanguinolenta, Myzomela 35, 49
sarasinorum, Phylloscopus 198
Sarothrura affinis 227
Sayornis nigricans 66
Schiffornis 98
Schiffornis turdina 98
schistacea, Coracina 44, 192
schistacea, Sporophila 58
schistaceus, Leucopternis 231
Schistochlamys melanopis 66
Scissirostrum dubium 185
sclateri, Loriculus 39, 188
Scytalopus griseicollis 19
Scytalopus latrans 62
Scytalopus parkeri 63
seebohmi, Bradypterus *42*, 46, 207
Selasphorus rufus 11
Selenidera culik 141
Selenidera piperivora 143
semiplumbeus, Leucopternis 231
semitorquatus, Lurocalis 54, 262
sepulcralis, Cacomantis 39, 40, *42*, 184
sericea, Leptocoma 38
simplex, Phaetusa 240, 244
socotrae, Buteo 118
socotraensis, Buteo 119, 120, 121, 122, 123, *124*, *125*, 127
socotraensis sp. nov., Buteo 119
socotrana, Emberiza 128
solstitialis, Troglodytes 66
somptuosus, Anisognathus 13, 20
sorghophilus, Acrocephalus 145
sororum, Aerodramus 190, 205
Spilornis rufipectus 38, 184
Spizaetus melanoleucus 54, 262
Spizella passerina 237, 242
splendens, Corvus 246–254
Sporophila 97, 98
Sporophila schistacea 58
spurius, Purpureicephalus 221
squamiger, Margarornis 65
stalkeri, Zosterops 199
stanleyii, Platycercus 221
stictopterus, Mecocerculus 66
stolidus, Anous 301
Streptocitta albertinae 38
Streptopelia chinensis 185, 205
striata, Butorides 184, 238
striaticollis, Mionectes 66
stuarti, Phaethornis 9, 11
subbrunneus, Cnipodectes 258
subgularis, Ptilinopus 38, 188

subochraceus, Phaethornis 9, 11
subulatus, Hyloctistes 52, 55
sula, Coracina 38, 44
sulaensis, Otus 41, 190
Sula leucogaster 301
sula, Sula 301
Sula sula 301
sulphurea, Gerygone 185
sumatrana, Ardea 38
sumatranus, Tanygnathus 184
superbus, Ptilinopus 186, 205
superrufus, Cnipodectes 258
Surniculus lugubris 189, 205
swainsonii, Gampsonyx 239
Sylvia communis 218
Synallaxis unirufa 65
Tachyphonus delatrii *56*, 58
taeniata, Dubusia 66
tahitica, Hirundo 38, 185
Tangara parzudakii 66
tangorum, Acrocephalus 146
Tanygnathus sumatranus 184
tenuepunctatus, Thamnophilus 65
tenuirostris, Coracina 156, *187*, 192
Tersina viridis 97
teysmanni, Rhipidura 49, 201, *202*, 203, 205
Thalurania furcata 8, 9, 11
Thamnomanes caesius 262
Thamnophilus tenuepunctatus 65
Thapsinillas affinis 44, 194
Thapsinillas longirostris 44, 194
thoracicus, Thryothorus 58
Thraupis palmarum 98
Threnetes leucurus 9
Thripadectes holostictus 65
Thryothorus atrogularis 58
Thryothorus euophyrs 66
Thryothorus thoracicus 58
Tiaris obscura 97
Tiaris olivaceus 242
Tigrisoma fasciatum 52, 53, *56*
Todirostrum 271
Todirostrum albifacies 255
Todirostrum chrysocrotaphum 271
Todirostrum cinereum 66
Tolmomyias 269
Torgos tracheliotus 212
torquata, Coeligena 9, 10, 65
torquata, Myrmornis 52, 56
torquatus, Celeus 262
torquatus, Gallirallus 184
tracheliotus, Torgos 212
Treron griseicauda 38, 184
Treron pembaensis 249
triangularis, Xiphorynchus 65
tricarunculatus, Procnias 57
Trichoglossus flavoviridis 38
Trichoglossus ornatus 184
trichroa, Erythrura 50
trinotatus, Accipiter 37
trizonatus, Buteo 128, 129
Troglodytes solstitialis 66
tucanus, Ramphastos 142
Turacoena manadensis 39, 184
turcosa, Cyanolyca 66
turdina, Schiffornis 98
Turdus fuscater 66
Turdus poliocephalus *42*, 45
Turnix maculosus 184
typica, Gazzola 177
typicus, Corvus 154, 157, 163, 166, *176*, 177, 178
Tyto inexspectata 189
Tyto nigrobrunnea 41, *42*
Tyto rosenbergii 189
Tyto sp. 189
unicolor, Corvus 154–165, *155*, 166–180, *173*, *175*, *176*, *177*, 194
unicolor, Gazzola 166, 167
unirufa, Cinnycerthia 66
unirufa, Synallaxis 65
Uria mandtii 150–152
Vanellus chilensis 239
vanikorensis, Aerodramus 41, 42, 190, 205
varia, Grallaria 98
variegatus, Merops 228, 229
variolosus, Cacomantis 39, 40, *42*
vaughani, Zosterops 249
vauxi, Chaetura 54
Vermivora ruficapilla 242
versicolor, Pachyramphus 66
violaceus, Ptilonorhynchus 111
viridans, Rostrata 142
viridis, Calyptomena 143–145
viridis, Tersina 97
vitiensis, Columba 39
vitiosus, Lophotriccus 268, 271
vocifer, Haliaeetus *211*, 212
wakoloensis, Myzomela 49, 204
watkinsi, Grallaria 98
westermanni, Ficedula 38
Xipholena atropurpurea 262
Xiphorynchus triangularis 65
yariguierum subsp. nov., Anisognathus lacrymosus 16
zonatus, Campylorhynchus 243
Zonotrichia capensis 66, 242
Zoothera erythronota 34, 195, 196
Zoothera mendeni 34, *187*, 195, *196*
Zosterops atrifrons 48, 198, *199*, 200, 205
zosterops, Hemitriccus 267, *268*
Zosterops montanus 35, *42*, 47
Zosterops nehrkorni 199
Zosterops stalkeri 199
Zosterops vaughani 249

CORRECTIONS TO TEXT

Page 34	last line	*Orthotomus cucullatus* not *Orthotomus cuculatus*
Page 47	line 3	*Orthotomus cucullatus* not *Orthotomus cuculatus*
Page 47	line 10	*O. cucullatus* not *O. cuculatus*
Page 119	lines 3–4	British Museum (Natural History) not British Museum of Natural History
Page 183	line 18	FER not DER
Page 189	line 1	FER not FE
Page 196	line 12	delete '(undescribed subspecies?)'
Page 197	line 8	delete '(undescribed subspecies?)'
Page 201	line 36	delete '(undescribed subspecies?)'
Page 204	line 10	delete '(undescribed species?)'

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CONTENTS

Club Announcements 233
SANDOVAL, L., SÁNCHEZ, C., BIAMONTE, E., ZOOK, J. R., SÁNCHEZ, J. E., MARTÍNEZ, D., LOTH, D. & O'DONAHOE, J. Recent records of new and rare bird species in Costa Rica 237
RYALL, C. Further records and updates of range extension in House Crow *Corvus splendens* 246
ZIMMER, K. J., WHITTAKER, A., GUILHERME, E. & MARTUSCELLI, P. Documented records of White-cheeked Tody-Tyrant *Poecilotriccus albifacies* from Acre, Brazil 255
COSTA, T. V. V., ANDRETTI, C. B., LARANJEIRAS, T. O. & ROSA, G. A. B. Discovery of White-winged Potoo *Nyctibius leucopterus* in Espírito Santo, Brazil, with remarks on its distribution and conservation in the Atlantic Forest 260
JOHNSON, E. I., VARGAS, C. F., COSTA, T. V. V. & ANDRETTI, C. B. A range extension and ecology of Boat-billed Tody-Tyrant *Hemitriccus josephinae* in central Amazonian Brazil 266
SUMMERS-SMITH, J. D. & TAGUCHI, F. House Sparrows *Passer domesticus* in Japan 273
BEEHLER, B. M. & PRAWIRADILAGA, D. M. New taxa and new records of birds from the north coastal ranges of New Guinea 277
BRETAGNOLLE, V. & SHIRIHAI, H. A new taxon of Collared Petrel *Pterodroma brevipes* from the Banks Islands, Vanuatu 286
MLÍKOVSKÝ, J. The taxonomic identity of *Motacilla luzonensis* Scopoli, 1786 302
PENHALLURICK, J. The correct name of the West African subspecies of African Lemon Dove *Columba larvata* 304
DICKINSON, E. C. The authorship of the name *Lophornis Verreauxii*; that of a subspecies of Festive Coquette 305
Index for Volume 130 (2010) 307

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Murray Bruce, R. T. Chesser, Edward C. Dickinson, Françoise Dowsett-Lemaire, Steven M. S. Gregory, José Fernando Pacheco, Robert B. Payne, Pamela C. Rasmussen, Cees Roselaar, Thomas S. Schulenberg, Lars Svensson

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